

ANNALS  
OF THE  
MISSOURI BOTANICAL GARDEN

#### ERRATA

- Page 278, 6 lines from bottom—for *viscossima*, read *viscosissima*.  
Page 278, 7 lines from bottom—for *viscossima*, read *viscosissima*.  
Page 297, next to last line of footnote—for Cotton, read Colton.  
Page 320, line 2—for  $\frac{1}{2}$ , read 1-2.  
Page 328, line 13—for p. 335, read p. 333.  
Page 330, first line, last paragraph—for pl. 13, read fig. 34.  
Page 354, line 5—for page 335, read page 333.  
Page 365, line 2—for southeastern, read southwestern.

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of the  
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# FLORA OF PANAMA

## Part III. Fascicle 1

### JUNCACEAE

Perennial, rarely annual, grass-like plants with stoloniferous rhizomes; stems scapiform, foliate chiefly at the base, the upper leaves usually reduced and distant; leaves narrow, sheathed at the base, the sheath open or closed; inflorescence terminal, paniculate (in Panama), bracteate; flowers small, actinomorphic, perfect; perianth of 6 equal glumaceous tepals; stamens 6, hypogynous, free; anthers basifixed, 2-celled; pistil superior, 1- to 3-celled; stigmas 3; capsule loculicidal, seeds 3 to numerous.

#### 1. LUZULA DC.

LUZULA DC. in Lam. & DC. Fl. Fr. 1:198. 1805; Buchenau in Engl. Pflanzenreich IV. 36:42. 1906.

Stoloniferous, tufted perennials; stems scapiform, foliate chiefly in a basal rosette; leaves grass-like, the basal sheaths closed; inflorescence paniculate, bearing very many small, glumaceous, perfect flowers.



Fig. 1. *Luzula gigantea*

1. *LUZULA GIGANTEA* Desv. in Jour. de Bot. 1:145. 1808; Buchenau in Engl. Pflanzenreich IV. 36:59. 1906.

*Luzula paniculata* Desv. loc. cit. 147. pl. 5. 1808.

*Luzula latifolia* Liebm. in Vid. Meddel. Nat. Foren. Kjöbenh. 47. 1850.

*Juncodes giganteum* (Desv.) Sheldon in Minnesota Bot. Stud. 1:62. 1894.

*Luzula gigantea* var. *vulcanica* Woodson in Ann. Missouri Bot. Gard. 26:275. 1939.

Stems erect or ascending, 1.5–9.0 dm. tall in flower; basal leaves rather broadly lance-ensiform, 5–30 cm. long, conspicuously subarachnoid-ciliate to glabrate; inflorescence broadly and rather diffusely paniculate, the minute florets scarious, shining, deep chestnut-brown.

Mexico to Bolivia, in mountain meadows and open forest.

CHIRIQUÍ: Potrero Muleto to summit, Volcán de Chiriquí, Maxon 5361, Woodson & Schery 432, Woodson, Allen & Seibert 1094.

The genus *Juncus*, with narrower leaves and open sheaths, almost certainly occurs in the mountains of Panama, although it has not as yet been collected. Three species have been reported from Costa Rica.

## LILIACEAE

Chiefly rhizomatous or bulbous perennial herbs; leaves usually alternate or radical, occasionally approximate or whorled; inflorescence various, usually racemose or umbelliform in Panama; flowers 6-merous (rarely 2- to 4- to 5-merous); perianth of 6 free or united, chiefly petalaceous segments; stamens as many as the perianth segments, the filaments free, the anthers free or coherent, chiefly versatile, dehiscing longitudinally; pistil 3-celled, each cell containing 1 to several ovules; fruit usually capsular, occasionally baccate.

- |  |               |
|--|---------------|
| a. Leaves chiefly in a basal rosette, those of the flowering scapes greatly reduced; rhizome short, vertical; fruit a capsule. |               |
| b. Anthers free  | 1. ANTHERICUM |
| bb. Anthers coherent   | 2. ECHEANDIA  |
| aa. Leaves all cauline; rhizome more or less elongate, horizontal; fruit a berry   | 3. SMILACINA  |

In Panama one may find numerous exotic genera of Liliaceae in cultivation, occasionally as escapes. These include *Allium*, *Asparagus*, *Agapanthus*, *Aloe*, *Dracaena*, *Sansevieria*, and *Taetsia*.

### 1. ANTHERICUM L.

ANTHERICUM L. Sp. Pl. 310. 1753; Krause in Engl. & Prantl, Nat. Pflanzenfam. 15a:282. 1930.

*Stellarioides* Medic. Acta Acad. Theod.-palat. 6:Phys. 369. 1790.

*Phalanganthus* Schrank, apud Haw. Syn. Pl. Succ. 67. 1819.

*Blephanthus* Raf. Fl. Tellur. 2:59. 1836.

*Endogona* Raf. loc. cit. 27. 1836.

*Obstita* Raf. loc. cit. 1836.

*Trachinema* Raf. loc. cit. 1836.

*Licinia* Raf. loc. cit. 3:57. 1836.

Subscapose herbs from a relatively short vertical rhizome producing numerous fleshy roots; leaves chiefly in a basal rosette, those of the flowering stem remote and greatly reduced, narrowly lanceolate to linear, parallel-veined; inflorescence terminating the flowering scape, simply racemose or occasionally branched at the base; flowers solitary or in pairs or small fascicles in the axils of scarious or slightly foliaceous bracts; perianth segments 6, free and essentially equal, 3- to 7-nerved; stamens 6, hypogynous, the anthers free at anthesis, sagittate; pistil 3-celled, the style simple, the stigma subcapitate; fruit a 3- to several-seeded capsule.

- a. Flowers yellow, 1.2–1.5 cm. long \_\_\_\_\_ 1. *A. ECHEANDIODES*  
aa. Flowers white, 0.6–0.7 cm. long \_\_\_\_\_ 2. *A. MACROPHYLLUM*

1. *ANTHERICUM ECHEANDIODES* Baker in Bot. Mag. *pl.* 6809. 1885.

*Anthericum apodanthum* Donn. Sm. in Bot. Gaz. 19:265. 1894.

Basal leaves linear, 17–25 cm. long, 0.8–1.0 cm. broad, glabrous; flowering scapes 24–36 cm. long, bearing several rather distant, reduced leaves or bracts; flowers showy, solitary or in small fascicles in the axils of small, scarious bracts; pedicels about 1 cm. long, articulated toward the base; perianth segments oblong-elliptic, 1.2–1.5 cm. long, bright yellow with 3 brown nerves; anthers 0.5 cm. long.

Southern Mexico to Costa Rica and Panama, in subalpine meadows.

CHIRIQUÍ: upper Río Chiriquí Viejo valley, P. White 32.

2. *ANTHERICUM MACROPHYLLUM* Baker in Engl. Bot. Jahrb. 8:209. 1887.

*Anthericum panamense* Standl. in Field Mus. Publ. Bot. 22:327. 1940.



Fig. 2. *Anthericum macrophyllum*



Basal leaves ensiform, long-acuminate, 15–30 cm. long, 1–2 cm. broad, multinerved, glabrous; flowering scapes 25–35 cm. long, simple or infrequently branched at the base, bearing many small white flowers; flowering bracts 0.3–1.0 cm. long, slightly foliaceous; pedicels 0.3–0.5 cm. long, articulated at the middle; perianth segments 0.6–0.7 cm. long; capsules broadly trigonal, 0.5–0.6 cm. long.

Costa Rica and Panamá; in highland forests.

COCLÉ: El Valle de Antón, Allen 1905, Woodson & Schery 178.

## 2. ECHEANDIA Ortega

ECHEANDIA Ortega, Nov. Pl. Descr. 90, 135. *t.* 18. 1797; Weatherby in Proc. Amer. Acad. 45:388. 1910.

*Ecbeandias* Post & O. Ktze. Lexic. Gen. Phan. 23. 1903.

Subscapose herbs from a rather short vertical rhizome, producing numerous fleshy, frequently tuberiferous roots; leaves chiefly in a basal rosette, those of the flowering scape remote and greatly reduced, narrowly lanceolate or ensiform, parallel-veined; inflorescence terminating the flowering scape, paniculately branched or infrequently simple and racemiform; flowers solitary or fasciculate; perianth segments 6, free, essentially equal; stamens 6, the anthers strongly connate at anthesis, sagittate; pistil 3-celled, the style simple, the stigma subcapitate; fruit a 3- to several-seeded loculicidal capsule.



Fig. 3. *Echeandia venusta*

- a. Flowers rather showy, the perianth segments oblong-elliptic, 1.5–2.0 cm. long, bright yellow. 1. *E. VENUSTA*  
 aa. Flowers inconspicuous, the perianth segments linear-lanceolate, 1.0–1.3 cm. long, white. 2. *E. PROLIXA*

### 1. ECHEANDIA VENUSTA Woodson in Ann. Missouri Bot. Gard. 29:325. 1942.

Perennial herbs 3–4 dm. tall, with short vertical rhizomes and clusters of fleshy subtuberous roots, glabrous throughout; leaves mostly radical, broadly linear, 12–30 cm. long, 1.0–1.5 cm. broad, white-margined; inflorescence racemiform, usually simple, the flowers in fascicles or solitary, subtended by very conspicuous foliaceous or spathaceous bracts 2–7 cm. long; pedicels 1.5–2.0 cm. long, articulated below the middle; perianth segments oblong-elliptic, 1.5–2.0 cm. long, golden yellow with 3 black nerves; staminal filaments about 0.5 cm. long, rugose, the anthers narrowly sagittate, about 0.6 cm. long.



Panama, in alpine meadows.

CHIRIQUÍ: Potrero Muleto, Volcán de Chiriquí, Woodson & Schery 379.

2. *ECHEANDIA PROLIXA* Woodson in Ann. Missouri Bot. Gard. 29:35. 1942.

Perennial herbs 8–12 dm. tall, with short vertical rhizomes and clusters of fleshy, tuberiferous roots, glabrous throughout; leaves mostly radical, broadly linear, 60–95 cm. long, about 2 cm. broad; inflorescence diffuse and usually more or less procumbent, paniculate-racemiform; flowers small, gathered into small fascicles subtended by small scarious bracts; pedicels 1.0–1.5 cm. long, articulated below the middle; perianth segments linear-lanceolate, 1.0–1.3 cm. long, white; anthers oblong-sagittate, 0.6 cm. long, the filaments of about equal length, rugose; capsules obovoid-oblongoid, truncate or slightly emarginate at the tip, narrowed toward the base, 0.7–0.8 cm. long, about 0.4 cm. broad.

Panama, on rocky hilltops near sea-level.

PANAMÁ: vicinity of Bejuco, Allen 2962.

3. *SMILACINA* Desf.

*SMILACINA* Desf. in Ann. Mus. Paris 9:51. *t. g.* 1807, *nom. conserv.*

*Vagneria* Adans. Fam. Pl. 2:496. 1763, *nom. rejic.*

*Tovaria* Neck. Elem. 2:190. 1790; Krause in Engl. & Prantl, Nat. Pflanzenfam. 15a:367. 1930, *nom. rejic.*

*Polygonastrum* Moench, Meth. 637. 1794, *nom. rejic.*

*Sigillaria* Raf. in Jour. Phys. 89:261. 1819.

*Styrandra* Raf. loc. cit. 102. 1819.

*Asteranthemum* Kunth, Enum. Pl. 5:151. 1850.

*Jocaste* Kunth, loc. cit. 154. 1850.

*Medora* Kunth, loc. cit. 155. 1850.

*Neolexis* Salisb. Gen. Pl. 64. 1866.

Mediocre to massive, caulescent herbs from a relatively elongate fleshy horizontal rhizome; leaves all cauline, alternate or approximate, parallel-veined; inflorescence a many-flowered, terminal panicle; perianth segments 6, equal, free; stamens 6, epipetalous; pistil superior, 3-celled; style terminal; stigma subcapitate; fruit a 1- to 6-seeded berry.

1. *SMILACINA PANICULATA* Mart. & Gal. in Bull. Acad. Brux. 9<sup>2</sup>:388. 1842.

*Tovaria thyrsoidea* Baker in Jour. Linn. Soc. Bot. 14:568. 1875.

*Tovaria laxiflora* Baker, loc. cit. 569. 1875.

*Tovaria nervulosa* Baker, loc. cit. 1875.

*Smilacina thyrsoidea* (Baker) Hemsl. Biol. Centr.-Am. Bot. 3:368. 1884.

*Smilacina laxiflora* (Baker) Hemsl. loc. cit. 1884.

*Smilacina nervulosa* (Baker) Hemsl. loc. cit. 1884.

Fig. 4. *Smilacina paniculata*

*Smilacina Gigas* Woodson in Ann. Missouri Bot. Gard. 27:270. 1940.

Plants terrestrial, rarely epiphytic, 0.4–3.0 m. tall, glabrous; leaves all cauline, shortly petiolate, narrowly lanceolate to broadly ovate, acuminate, 6–30 cm. long; panicles 3–50 cm. long, 2–25 cm. broad, bearing many small white flowers; pedicels solitary, 1–10 mm. long, white or deep red; perianth segments ovate-lanceolate, 3–5 mm. long; berries globular, 0.3–0.4 cm. thick.

Mexico to Panama, in mountain forests.

CHIRIQUI: valley of upper Río Chiriquí Viejo, Allen 1392; from Cerro Punta to headwaters of Río Caldera, Allen 1446; Bajo Chorro, Davidson 53; Volcán de Chiriquí, Killip 360, Pittier 3071, Woodson, Allen & Seibert 852; Bajo Mona and Quebrada Chiquero, Woodson & Schery 512; Cerro Copete, Woodson & Schery 339.

Abundant in the highland forests of Chiriquí, and extremely variable in size and general aspect; occasionally epiphytic.

## SMILACACEAE<sup>1</sup>

By C. V. MORTON

### 1. SMILAX L.

SMILAX L. Sp. Pl. 1028. 1753; Apt, in Fedde Repert. Sp. Nov. 18:385–422. 1922; Killip & Morton in Carn. Inst. Publ. 461:255–296. 1936.

Woody vines from large rhizomes; leaves alternate, palmately nerved, the petiole sheathing at base, bearing a pair of tendrils at the apex of the sheath; flowers unisexual, borne in solitary axillary umbels, or the umbels pseudoracemose on short axillary branchlets; perianth segments 6, distinct, narrow, equal or nearly so; stamens 6, the filaments slender, free; styles 3; ovules solitary in the cells, pendulous; fruit a fleshy berry, commonly 1-seeded.

The rhizomes of certain species produce the well-known Sarsaparilla of commerce.

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

- a. Plants entirely glabrous, sometimes spiny.
  - b. Staminate flowers 2.8 mm. long or less; leaves with reticulate secondary veins, usually aculeate on the nerves beneath; branchlets angular; peduncles shorter than the petioles..... 1. *S. SPINOSA*
  - bb. Staminate flowers 4 mm. long or more; leaves unarmed.
    - c. Peduncles of pistillate umbels shorter than the subtending petioles, terete; stems terete; anthers shorter than the filaments; staminodia 3..... 2. *S. DOMINGENSIS*
    - cc. Peduncles of pistillate umbels longer than the petioles, flattened; staminodia 6 (not known in *S. chiriquensis*).
      - d. Anthers longer than the filaments; stems (at least the lower) terete.
        - e. Staminate flowers sessile; staminate umbels solitary, axillary, long-peduncled; leaves 5-nerved (the outer nerves marginal), the secondary veins parallel..... 3. *S. SPISSA*
        - ee. Staminate flowers obviously pedicellate; staminate umbels borne on short, bracteate, raceme-like branchlets; leaves 7-nerved (the outer nerves marginal), the secondary veins prominently reticulate..... 4. *S. PANAMENSIS*
      - dd. Anthers much shorter than the filaments; stems sharply quadrangular..... 5. *S. CHIRIQUENSIS*
- aa. Plants hairy or, in *S. subpubescens*, glabrate at maturity, but then at least a few hairs persistent on the petioles, peduncles or pedicels, always unarmed; anthers shorter than the filaments.
  - b. Branchlets obtusely quadrangular, glabrate at maturity; staminodia 6; inflorescence and young growth rusty-tomentose; peduncles shorter than the subtending petioles; leaves glabrate at maturity..... 6. *S. SUBPUBESCENS*
  - bb. Branchlets terete (except the lowermost), hairy even at maturity; staminodia 3..... 7. *S. MOLLIS*

Fig. 5. *Smilax spinosa*

1. *SMILAX SPINOSA* Mill. Gard. Dict. ed. 8, no. 8. 1768.

*Smilax Houstoniana* Steud. Nom. ed. 2: 2:599. 1841 (illegit.)

*Smilax mexicana* Griseb. ex Kunth, Enum. 5:167. 1850.

*Smilax Wagneriana* A. DC. Monogr. Phan. 1:143. 1878.

Stems aculeate or rarely unarmed, the upper 4- to 6-angled, often flexuous; petioles rarely over 1 cm. long; lower leaf blades ovate to broadly elliptic, up to 14 cm. long and 8 cm. wide, subcordate at base, the upper much smaller, acute at base, all 5-nerved, the veins prominently reticulate and elevated on both surfaces, often aculeate beneath; peduncles of staminate umbels solitary, up to 1 cm. long, shorter than the subtending petiole, flattened; pedicels slender, 5-13 mm. long, longer than the peduncle; perianth seg-

ments ovate-oblong or oblong, 2.8 mm. long or less, 1–1.4 mm. wide; filaments shorter or longer than the anthers; peduncles of pistillate umbels up to 9 mm. long, shorter than the subtending petiole, flattened; staminodia 3 or 6, minute; berries black, globose, 4–12 mm. thick.

Mexico, south to Panama.

CANAL ZONE: Río Cocoli, P. White 143; Ancón Hill, Seibert 122; Fort Lorenzo, Piper 5954. CHIRIQUÍ: Boquete, Davidson 651. COCLÉ: Penonomé, R. S. Williams 241. PANAMÁ: Taboga Island, Woodson, Allen & Seibert 1481; Punta Paitilla, Standley 26306; swamp east of Río Tecúmen, Standley 26670; between Las Sábanas and Matías Hernández, Standley 31872; Río Tapia, Maxon & Harvey 6622; near Vigía and San Juan, Dodge, Steyermark & Allen 16594. VERAGUAS: Cañazas, Allen 157.

The type of *S. Wagneriana* was collected by M. Wagner in the province of Chiriquí. The var. *compta* Killip & Morton (Carn. Inst. Publ. 461:264. 1936) is distinguished by the scabrous stems covered with minute setiform spinules, which are found also on the leaf blades. It has been collected only near Alhajuela, Chagres Valley, Prov. Panamá, by Pittier (no. 3487). An insufficiently known plant is *S. lappacea* var. *ornata* Killip & Morton (op. cit. 289), described from sterile material collected at Gamboa, Canal Zone (Heriberto 71). It resembles *S. spinosa*, but the leaves are narrower. The stems are spiny, but not scabrous as in *S. spinosa* var. *compta*. The leaves are aculeate beneath, and also conspicuously setulose on the veins.

## 2. SMILAX DOMINGENSIS Willd. Sp. Pl. 4:783. 1806.

*Smilax Schlechtendalii* Kunth, Enum. 5:224. 1850.

Stems all terete, smooth, the lower sparingly aculeate, the upper unarmed; petioles up to 1.6 cm. long; leaf blades ovate-lanceolate or ovate, usually not over 9 cm. long and 5 cm. wide, dark green and shining above, unarmed, 5-nerved, the outer nerves marginal, the veins elevated on both surfaces, reticulate; peduncles of staminate umbels solitary or in short, bracteate, axillary branchlets, 1–5 mm. long, much shorter than the subtending petiole; pedicels 4–7 mm. long; perianth segments ligulate, 4.5–6.5 mm. long, 1.2–1.5 mm. wide; filaments 3–4 mm. long, the anthers shorter, 1.2–2 mm. long; peduncles of pistillate umbels subterete, up to 7 mm. long, much shorter than the subtending petiole; pedicels longer than peduncle; staminodia 3, about 1 mm. long; fruiting pedicels 4–10 mm. long; fruits dull-red or brown, globose, 5–10 mm. in diameter.

Southeastern United States, West Indies, and Mexico to Panama.

PANAMÁ: Juan Díaz, Standley 30633. CANAL ZONE: Aspinwall, Hayes 638.

## 3. SMILAX SPISSA Killip & Morton in Carn. Inst. Publ. 461:273. 1936.

Upper stems slender, terete, not flexuous, unarmed; petioles up to 2 cm. long; leaf blades oblong, up to 16 cm. long and 6 cm. wide, acute at base, 5-nerved, the outer nerves marginal, the veins impressed above, elevated beneath, the secondary subparallel, not conspicuously reticulate; peduncle of staminate umbel solitary,

up to 4.5 cm. long, longer than the subtending petiole; pedicels obsolete; flowers numerous, crowded, the outer perianth segments 4 mm. long and 1.5 mm. broad, the inner somewhat smaller; filaments 1-1.5 mm. long, the anthers longer, 1.5-2 mm. long; fruiting peduncle solitary, 1.5-2.3 cm. long, terete, longer than the subtending petiole; berry red, large, up to 15 mm. in diameter.

Costa Rica and Panama.

CANAL ZONE: Barro Colorado Island, Standley 31295, 31314, 40796, 40820, Bailey & Bailey 364, Shattuck 767, Wetmore & Woodworth 49; between Gorgona and Gatún, Pittier 2260.

4. *SMILAX PANAMENSIS* Morong in Bull. Torr. Bot. Club 21:441. 1894.

*Smilax ramonensis* Apt in Fedde Repert. Sp. Nov. 18:405. 1922.

Stems terete, smooth, the lower armed with broad-based spines 2 cm. long, the upper unarmed; petioles up to 3 cm. long; leaf blades ovate-oblong or the upper lanceolate-oblong, up to 19 cm. long and 9.5 cm. wide, acute or obtuse at base, unarmed, 7-nerved, the outer nerves marginal, the secondary veins prominently reticulate; staminate umbels borne on short, bracteate, axillary branchlets, these often paired or clustered, the peduncle proper up to 2 cm. long, flattened; pedicels 5-8 mm. long; perianth segments 4-6 mm. long, 1.5-1.75 mm. wide; anthers 2-2.75 mm. long, slightly or much longer than the filaments; peduncles of pistillate umbels solitary or on short, bracteate, axillary branchlets, the peduncle proper up to 1.5 cm. long, flattened; staminodia 6; fruiting peduncles up to 2.5 cm. long, the pedicels 7-15 mm. long, bulbous at base; berries probably red, 7.5-10 mm. in diameter.

Honduras, Costa Rica and Panama.

CANAL ZONE: Gatún, Hayes 63 (TYPE); Barro Colorado Island, Shattuck 699, Wetmore & Abbe 168. CHIRIQUÍ: Paso Ancho to Monte Lirio, Allen 1584.

5. *SMILAX CHIRIQUENSIS* Morton, in Woodson & Schery, Ann. Missouri Bot. Gard. 29:326. 1942.

Vine 25 feet long, the stems conspicuously and sharply quadrangular, pale yellowish, glabrous, sparingly aculeate; petioles elongate, those of the larger leaves 6 cm. long, glabrous, articulate at or above the middle; leaf blades ovate, up to 19 cm. long and 12 cm. wide, short-apiculate at apex, the larger cordate at base, the smaller truncate, all entire, glabrous, 9-nerved, the outer nerves marginal, the secondary veins conspicuously reticulate, elevated on both surfaces; staminate umbels borne on short, axillary branchlets, the leaves subtending the umbels well developed or reduced to sheaths only; peduncle 1-3 cm. long, glabrous, strongly flattened, longer than the subtending petiole; pedicels 5-11 mm. long, glabrous; perianth segments linear, 8-9 mm. long, about 1.5 mm. wide, glabrous; filaments about 6 mm. long, the anthers much shorter, about 1.5 mm. long; pistillate flowers and fruits unknown.

Confined to Panama.

CHIRIQUÍ: valley of upper Río Chiriquí Viejo, P. White 348 (TYPE), G. White 59; Bajo Mona, Boquete, Davidson 478.

6. *SMILAX SUBPUBESCENS* A. DC. Monogr. Phan. 1:69. 1878.

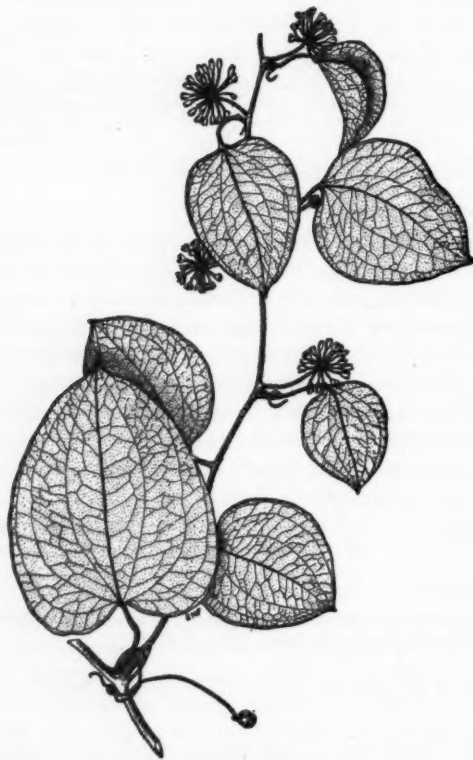


Fig. 6. *Smilax subpubescens*

*Smilax calocardia* Standl. in Field Mus. Publ. Bot. 22:7. 1940.

Stems obtusely quadrangular, unarmed, tomentose when young, glabrate at maturity; petioles up to 7 cm. long, often persistently hairy, at least on sheath; leaf blades broadly ovate, up to 24 cm. long and 19 cm. wide, deeply and openly cordate at base, the upper leaves smaller, often merely rounded or subtruncate at base, all unarmed, densely reddish-tomentose on both sides when very young, the older leaves nearly glabrous, 9- to 11-nerved, the secondary veins prominently reticulate; peduncles of staminate umbels solitary, up to 3.5 cm. long, usually shorter than the subtending petiole, flattened, tomentulose when young; perianth segments narrowly oblong, 5-6 mm. long, 1-1.5 mm. wide, densely or sparsely tomentulose; filaments 2.5-4 mm. long,

the anthers much shorter, 1.6-2 mm. long; peduncles of pistillate umbels about 1 cm. long, shorter than the subtending petiole; pedicels about 6 mm. long; staminodia 6; fruiting peduncles up to 2.5 cm. long; berries orange.

Mexico to Panama.

CHIRIQUÍ: Finca Lérica, Woodson & Schery 218; Finca Lérica to Peña Blanca, Woodson & Schery 305, 306; Potrero Muleto to summit of Volcán de Chiriquí, Woodson & Schery 456; Casita Alta, Woodson, Allen & Seibert 799, 822, 974; valley of upper Río Chiriquí Viejo, vicinity of Monte Lirio, Seibert 270; Volcán de Chiriquí, Davidson 953 (TYPE of *S. calocardia*).

7. *SMILAX MOLLIS* Humb. & Bonpl. ex Willd. Sp. Pl. 4:785. 1806.

Stems terete, unarmed, pilosulous or subtomentose; petioles up to 1.8 cm.



long, densely pubescent; leaf blades ovate-oblong or oval, up to 18 cm. long and 10.5 cm. wide, the upper much smaller, all unarmed, cordate at base, persistently hirsutulous on veins beneath, 7-nerved, the two outer marginal, the secondary veins prominently reticulate; peduncle of staminate umbel up to 4 cm. long, much longer than the subtending petiole, terete, densely short-hirsute; pedicels 3-5 mm. long, hirsutulous or rarely glabrous; perianth segments oblong-linear, 4-5 mm. long, 1 mm. wide, sparingly hairy or glabrous except for a tuft of hairs at apex; filaments 2-3.5 mm. long, the anthers much shorter, 1-1.2 mm. long; peduncle of pistillate umbels up to 3 cm. long, terete or slightly flattened, densely short-hirsute, usually longer than the subtending petiole; pedicels 3-5 mm. long, hirsutulous; staminodia 3; berries red or yellow, 4-8 mm. in diameter.

Mexico to Panama.

CANAL ZONE: Fort Randolph, *Standley* 28685; Fort Sherman, *Standley* 31103; between France Field and Catival, *Standley* 30310; Obispo, *Standley* 31754; Barro Colorado Island, *Standley* 31431, 40829, 40956; Frijoles, *Allen* 923. CHIRIQUÍ: Boquete, *Davidson* 775. COCLÉ: Bismarck, *R. S. Williams* 610.

## HAEMODORACEAE

### 1. XIPHIDIUM Aubl.

XIPHIDIUM Aubl. Pl. Guian. 1:33. t. II. 1775.

Perennial herbs with more or less elongate horizontal rhizomes; stems erect or ascending, usually unbranched; leaves alternate, equitant, ensiform, with closed basal sheaths, parallel-nerved; inflorescence terminal, a panicle of simple scorpioid cymes, bearing numerous rather small white flowers; flowers perfect, regular; perianth segments 6, petalaceous, persistent; stamens 3; filaments free; anthers 2-celled, longitudinally dehiscent; pistil subinferior, 3-celled; fruit a many-seeded berry.



Fig. 7. *Xipidium caeruleum*

1. XIPHIDIUM CAERULEUM Aubl. Pl. Guian. 1:33. t. II. 1775.

*Ixia Xipidium* Loeff. Iter Hisp. 179; 1758.  
*Xipidium album* Willd. Sp. Pl. 1:249. 1797.  
*Xipidium floribundum* Sw. Fl. Ind. Occ. 1:80. 1797.  
*Xipidium giganteum* Lindl. in Bot. Reg. pl. 66. 1846.

Plants somewhat Iris-like, 3-8 dm. tall; leaves 20-50 cm. long, 1.5-4.5 cm. broad, minutely dentate-lacerate toward the tip; panicles 7-30 cm. long, 3-12 cm. broad, bearing numerous small white flowers; peduncle usually scurfy-puberu-

lent; pedicels 0.3–0.4 cm. long; perianth segments 0.4–0.6 cm. long; berries dull red, globose, about 0.5 cm. in diameter.

Mexico to Brazil and Bolivia; Antilles. Very common in lowland forests, occasionally at higher altitudes.

BOCAS DEL TORO: Almirante, *von Wedel* 10; Water Valley, *von Wedel* 1370; Shepherd Island, *von Wedel* 2692; Changuinola valley, *Dunlap* 250. CANAL ZONE: Ancón Hill, *Seibert* 384; Las Cruces, *Seibert* 580; Rio Pequeni, *Dodge, Steyermark & Allen* 16597; Gatún Lake, *Standley* 31407; Culebra, *Pittier* 4776. CHIRIQUÍ: Boquete, *Woodson & Schery* 760. PANAMÁ: Río La Maestra, *Allen* 67; Río Tapia, *Standley* 26135; Río Chilibre, *Piper* 5682; Juan Díaz, *Killip* 3108.

Locally known as *Palma*, *Palmita*, and *Palma del norte*.

## AMARYLLIDACEAE

Chiefly scapose herbs from bulbs, corms, or tuberous rhizomes, occasionally herbaceous vines or stout xerophytes; inflorescence various; flowers usually showy, perfect, regular (in Panama); perianth of 6 separate or united petaloid segments, occasionally with an annular corona; stamens 6, filaments hypogynous or inserted on the tube of the perianth; anthers 2-celled, basifixed or versatile, dehiscent longitudinally; pistil inferior (in Panama), 3-celled (rarely 1-celled); ovules numerous; fruit a capsule or a berry.

- a. Stout acaulescent or subacaulescent xerophytes with coriaceous rigid leaves; inflorescence a massive terminal panicle.
  - b. Perianth rotate, the segments barely united at the base; stamens shorter than the perianth..... 1. FURCRAEA
  - bb. Perianth funnel-shaped, the segments united into a definite basal tube; stamens conspicuously exserted..... 2. AGAVE
- aa. Herbaceous vines with leafy stems; inflorescence chiefly umbelliform, rarely 1-flowered; perianth segments free to the base..... 3. BOMAREA
- aaa. Scapose herbs with basal, usually succulent leaves; inflorescence umbelliform or 1-flowered; perianth segments united at the base.
  - b. Perianth without a tube (but the ovary long-beaked and resembling a narrow tube in *Curculigo*); plants scatteringly long-pilose, especially the inflorescence.
    - c. Fruit a capsule, not beaked..... 4. HYPOXIS
    - cc. Fruit fleshy and indehiscent, ending in a long beak..... 5. CURCULIGO
  - bb. Perianth with a manifest, usually elongate tube; plants glabrous.
    - c. Corona absent, the staminal filaments terete or narrow to their base.
      - d. Flowers in umbels of several, large and showy; plants usually massive..... 6. CRINUM
      - dd. Flowers solitary, rarely paired, rather small; plants small..... 7. ZEPHYRANTHES
    - cc. Corona present, the staminal filaments greatly dilated and petaloid at their base.
      - d. Perianth segments broadly ovate or ovate-lanceolate, the corona annular; leaves broadly ovate, with a long narrow petiole..... 8. EUCHARIS
      - dd. Perianth segments narrowly linear, the corona scyphiform; leaves lorate, sessile..... 9. PANCRACTIUM

Amongst cultivated Amaryllids, the Tuberose, *Polianthes*, popularly known as *Nardo*, is very frequent. Other exotic genera of gardens include *Agave*, *Hippeastrum*, and *Sprekelia*.



## 1. FURCRAEA Vent.

FURCRAEA Vent. in Bull. Soc. Philom. 1:65. 1793.

*Furcraea* Willem. in Usteri Ann. der Bot. 18:26. 1796.

*Fourcroya* Haw. Syn. Pl. Succ. 73. 1812.

*Furcroya* Raf. Princ. Somiol. 31. 1814.

*Furcroya* Benth. & Hook. Gen. Pl. 3:739. 1883.

Plants massive, acaulescent or with short stout trunks; leaves closely crowded, ensiform, very heavily coriaceous, usually armed with recurved thorns upon the margin; inflorescence a panicle, usually massive and many-flowered, the flowers frequently replaced by bulbils; perianth rotate, 6-parted, the tube short and cylindrical, the lobes subequal, spreading, white or greenish; stamens 6, the filaments attached to the throat of the perianth tube; anthers versatile; pistil 3-celled, oblong, containing numerous ovules; style short and thick; stigma capitate; fruit an oblong, loculicidal capsule containing many flat seeds.

1. FURCRAEA CABUYA Trel. in Ann. Jard. Bot. Buitenzorg, II Ser. Suppl. 3:906. pl. 36. 1910.

*Fourcroya gigantea* Vent. and *F. tuberosa* (Miller) Ait. acc. to Seem. Bot. Voy. Herald, 216. 1854.



Fig. 8. *Furcraea cabuya*

Massive xerophytes 2-7 m. tall, somewhat resembling an *Aloe* or a *Yucca*, acaulescent or with a short stout trunk less than 1 m. tall; leaves in a dense rosette, lance-ensiform, gradually acuminate to a sharp acumen, 1-3 m. long, 15-20 cm. broad, very heavily coriaceous, the margin beset with stout recurved thorns, green or somewhat glaucous, the upper surface rather closely lined with paler stripes; panicles very massive, bearing many greenish white flowers, or these replaced by bulbils; flowers very shortly pedicellate; ovary narrowly oblong-fusiform, about 1.5 cm. long; perianth segments barely united at the base, ovate, acuminate, about 1.5-3.0 cm. long.

Costa Rica, Panama, in semi-xerophytic llanos and savannas.

CHIRIQUÍ: Llanos del Volcán, Seibert 343, Seemann.

- 1a. FURCRAEA CABUYA var. INTEGRÁ Trel. loc. cit. 907. 1910.

Like the preceding, but the leaf margins unarmed.

PANAMÁ: near Panama City, Verner s. n.

This magnificent species is the outstanding xerophyte of Panama, where it is popularly known as *Cabuya* or *Cabuya blanca* since the time of the Spanish naturalist Oviedo. The typical and the unarmed varieties are sometimes distinguished as *Cabuya con espinas* or *Cabuya sin espinas*. Standley reports that the flowers

occasionally are employed in flavoring food. According to Seemann, the plant was cultivated "to a considerable extent" as early as 1846 on account of its fibre from the leaves, used for making rope and hammocks. Such cultivation, however, is not apparent at the present time.

## 2. AGAVE L.

AGAVE L. Sp. Pl. 323. 1753.

Plants massive, acaulescent or with a short stout trunk; leaves closely crowded, ensiform, heavily coriaceous, usually armed with spines upon the margin, the tip ending in a stout spine; inflorescence a panicle or paniculate spike, usually massive and many-flowered, but the flowers frequently replaced by viviparous bulbils; perianth funnel-shaped, 6-parted, the tube rather elongate, the lobes subequal, usually greenish white; stamens 6, widely exerted from the perianth, the filaments attached to the perianth tube; anthers versatile; pistil 3-celled, containing numerous ovules; style rather short and thick; stigma capitate; fruit a loculicidal capsule containing many seeds.

1. AGAVE PANAMANA Trel. in Standl. Contr. U. S. Nat. Herb. 23:114. 1920.

Leaves rather thin, 6-7 dm. long, 3-5 cm. wide, with a stout black terminal spine 1-2 cm. long, and rather distant marginal teeth 0.1-0.2 cm. long; panicle 1-3 m. tall with numerous secondary branches 5-12 cm. long, the flowers numerous at the tips of the corymbosely branching secondary peduncles, frequently replaced by viviparous bulbils; flowers funnel-shaped, greenish white or yellow, the narrow tube about 3.5 cm. long, the lobes acuminate, virtually erect, 2.0-2.5 cm. long; stamens widely exerted, the filaments 5-6 cm. long, the anthers sublinear, 2 cm. long.

Known only from Panama on the semi-xerophytic shores and islands of the Gulf of Panama.

PANAMÁ: Urava Island, *Howe s. n.*; rocky headlands, Vacamonte Point, *Allen 2958*.

The Agaves include the familiar "Century Plants." *A. picta* Salm-Dyck, with yellow leaf margins, is cultivated occasionally in Panama.

## 3. BOMAREA Mirb.

By E. P. KILLIP

BOMAREA Mirb. Hist. Nat. Pl. 9:71. 1804.

Vines (the Panama species), often high-climbing, generally with fibrous, often tuberiferous roots and resupinate leaves, the stem unbranched, terminating in an umbel of showy flowers, the rays simple or branched; perianth funnel-shaped, the tube none, the outer segments (sepals) prevailing oblong or oblanceolate, firm in texture, the inner (petals) unguiculate, thinner than the sepals and subequaling or exceeding them; anthers oblong, basifixed; fruit usually 3-angled and dehiscent, with red, subglobose seeds.

- a. Umbel rays usually more than 10, unbranched, ebracteolate or with a small bractlet near base; sepals red or orange, shorter than the petals; plants of the highlands.
  - b. Rays and ovary glabrous, the rays very slender. 1. *B. CHIRIQUINA*
  - bb. Rays and ovary viscous-tomentulose. 2. *B. HIRSUTA*
- aa. Umbel rays usually fewer than 10, furcate or with several divaricate pedicels, bracteolate; sepals pink, subequaling or longer than the petals; plants of the lowlands.
  - b. Ovary and rays pubescent, the rays bearing several subsecund, divaricate pedicels. 3. *B. CHONTALENSIS*
  - bb. Ovary and rays glabrous, the rays furcate, the branches ascending.
    - c. Flowers 4 cm. or more long; bractlets leaf-like, more than 3 cm. long. 4. *B. ALLENI*
    - cc. Flowers smaller; bractlets much reduced, not more than 2 cm. long. 5. *B. EDULIS*

1. *BOMAREA chiriquina* Killip, sp. nov.

Caulis volubilis, glaber; folia lanceolata, membranacea, glabra; radii 12-35, tenuissimi, ut ovarium glaberrimi; segmenta perianthii inaequalia, petalis quam sepalis ca. 5 mm. longioribus. (*Eubomarea* § *Caldasianae*)



Fig. 9. *Bomarea chiriquina*

dehiscent; seeds 4 mm. long.

Mountains of Chiriquí, alt. 1500-2000 m.

CHIRIQUÍ: Cerro Punta, alt. 2000 m., Jan. 21-24, 1939, Allen 1556 (U. S. Nat. Herb., TYPE), Bouché 432; Río Chiriquí Viejo, G. White 10, P. White 327; Volcán de Chiriquí, Woodson, Allen & Seibert 914, 953, Davidson 941; between Finca Lérída and Peña Blanca, Woodson & Schery 296, 297, 327.

Vine, 4-10 m. long, glabrous throughout, even the rays and the ovary without a vestige of indument; stem subangular; leaves lanceolate, 3-15 cm. long, 1-4 cm. wide, attenuate-acuminate at apex, abruptly tapering at base to an undulate-margined petiole up to 1 cm. long, closely nerved, membranous; outer bracts oblanceolate, 2-3 cm. long, 0.5-1 cm. wide, acuminate, reflexed, reddish, the inner narrowly linear, erect or divaricate, about half as long; umbel to 35-rayed, the rays 3-8 cm. long, very slender, wiry, simple, ebracteolate or bearing toward the base a small ovate bractlet up to 3 mm. long; ovary short-turbinate; sepals oblong-spatulate, about 2.5 cm. long and 8 mm. wide, obtuse, scarlet (red, orange, pinkish orange); petals about 3 cm. long, orange, obscurely purple-spotted, the blade cuneiform, 1 cm. wide, gradually tapering to a claw about 1 cm. long; anthers oblong, 3 mm. long, with a circular cavity at the base; fruit 1.5-2 cm. wide, sharply angled, soon

2. *BOMAREA HIRSUTA* (HBK.) Herb. Amaryl. 114. 1837.*Alstroemeria hirsuta* HBK. Nov. Gen. & Sp. 1:285. 1816.

Leaves lanceolate or oblong-lanceolate, 4–10 cm. long, 1–3 cm. wide, cuspidate-acuminate, membranous; umbel rays usually 20–40, up to 5 cm. long, rarely fewer or longer, simple, ebracteolate, viscous-tomentose; ovary turbinate-campanulate, viscous-tomentose; sepals oblong, 1.5–2 cm. long, red or crimson; petals cuneate-unguiculate, 2–3 cm. long, red or orange, unspotted or with numerous very small, reddish or brownish spots.

In typical *B. hirsuta* the under-side of the leaves is densely hirsute or hirsute-tomentose. This is common in Colombia, rare in Costa Rica, and so far not known from Panama. The following variety, with the leaves glabrous, or very sparingly pubescent beneath, has the same range as the typical form and is represented in Panama by several collections:

1a. *BOMAREA HIRSUTA* var. *concolor* (Cuf.) Killip, comb. nov.*Bomarea Caldasiana* Herb. var. *concolor* Cuf. in Archiv. Bot. Sist. Fitog. 9:186. 1933.

CHIRIQUÍ: Cuesta de Cerro Quemado, eastern slope of Volcán de Chiriquí, alt. 1800–2160 m., Maxon 5371; Bajo Chorro, alt. 1900 m., Woodson & Schery 615, Davidson 89 (approaching *B. costaricensis* Kränzl.), 338; Loma Larga to summit, Volcán de Chiriquí, alt. 2500–3380 m., Woodson, Schery & Seibert 1072; Casita Alta to Cerro Copete, 2300–3300 m., Woodson & Schery 343.

3. *BOMAREA CHONTALENSIS* Seemann in Gard. Chron. 1871:479, 1387, f. 305. 1871.*Bomarea edulis* var. *chontalensis* Baker, Amaryl. 154. 1888.

Stem glabrous; leaves oblong-lanceolate, 8–15 cm. long, 1.5–5 cm. wide, membranous, glabrous; bracts similar and subequal to the leaves; umbel rays 2–6, stout, up to 25 cm. long, ferruginous-puberulent, bearing 3–7 subsecund, pediceled flowers, bracteolate at the base of the divaricate pedicels, the bractlets lance-ovate, about 1.5 cm. long, pubescent; ovary elongate-obconical, ferruginous-tomentulose; sepals broadly obovate, 2.5–3 cm. long, 1–1.5 cm. wide, pink; petals slightly shorter than the sepals, the blade broadly ovate, rounded, pale yellow, greenish toward the apex, blotched with brown.

Nicaragua to western Panama, at low elevations.

BOCAS DEL TORO: Nievacita, near sea-level, Woodson & Schery 1027.

4. *BOMAREA Alleni* Killip, sp. nov.

Herba volubilis vel subvolubilis, ubique glabra; folia lanceolata, membranacea; bracteae foliaceae; radii 3–5, simplices vel furcati, bracteolis foliaceis, amplis; ovarium longe turbinatum; sepala et petala subaequalia, rosea, sepalis oblanceolatis, petalis oblongo-spathulatis, unguiculatis. (Eubomarea § Edules)

Vine or vine-like herb, 7 m. long, glabrous throughout; leaves lanceolate, 15–20 cm. long, 3–5 cm. wide, attenuate-acuminate at the apex, abruptly nar-

rowed at the base to a stout, margined petiole up to 1.5 cm. long, membranous, the nerves subequally prominent, the cross-veins conspicuous; bracts 6, whorled at the base of the inflorescence, similar to and slightly smaller than the leaves; umbel 3- to 5-rayed, the rays up to 30 cm. long, unbranched or with 1 or 2 short 1-flowered lateral branches, bracteolate, the bractlets similar to the bracts, decreasing from 11 cm. long and 4 cm. wide (lowermost) to 3.5 cm. long and 1.5 cm. wide; ovary long-turbinate, 6-angled, truncate; sepals oblanceolate, 4-5.5 cm. long, 1.3-1.5 cm. wide, minutely corniculate dorsally just below the rounded apex, shell-pink, with a few scattered red spots near the apex within; petals equal to or slightly shorter than the sepals, shell-pink, densely spotted with reddish brown, bearing a green blotch near the apex, the blade oblong-spatulate, 8-14 mm. wide at the widest point, tapering gradually to a claw about 1.5 cm. long; anthers ovate-oblong, 3 mm. long, with a circular cavity at the base; style about 3.5 cm. long; young fruit 3.5 cm. long, 2 cm. in diameter.

PANAMÁ: El Valle de Antón, along the Río Indio trail, alt. 500-700 m., Jan. 31, 1935, *Hunter & Allen 325* (Mo. Bot. Gard., TYPE; duplicate at U. S. Nat. Herb.); vicinity of La Mesa, north of El Valle de Antón, alt. 1000 m., *Allen 2491*.

Related to the Colombian *B. Carderi* Mast., differing in having large, leaf-like bractlets and proportionately broader sepals.

5. *BOMAREA EDULIS* (Tussac) Herb. Amaryl. 111. 1837.

*Alstroemeria edulis* Tussac, Fl. Antill. 1:109. pl. 14. 1808.



Fig. 10. *Bomarea edulis*

Stem glabrous; leaves lanceolate, 6-10 cm. long, 1.5-3 cm. wide (rarely smaller or larger), membranous, glabrous; bracts similar to the leaves but usually much smaller; umbel 4- to 10 (rarely to 20)-rayed, the rays slender, up to 12 cm. long, once- or twice-forked, bracteolate at the forks, the bractlets linear-lanceolate, up to 1.5 cm. long; sepals obovate or oblong-obovate, 2-3 cm. long, bright pink; petals cuneate-spatulate, subequal to the sepals, yellow, green-tinged and purple-spotted.

Mexico, Central America, and the West Indies; apparently also in eastern Brazil. At low elevations.

COCLÉ: between Las Margaritas and El Valle, *Woodson, Allen & Seibert 1342*.



## 4. HYPOXIS L.

HYPOXIS L. Syst. 986. 1759; Brackett in *Rhodora* 25:120-147. 1923.

*Fabricia* Thunb. in Fabricius, *Reise Norweg.* 23. 1779, in part.

*Niobe* Willd. ex. Schult. f. Syst. Bot. 7:762. 1830.

*Franquevillea* Zoll. apud Miq. Fl. Ind. Bat. 3:586. 1858.

Small scapose herbs from corm-like rhizomes, scatteringly pilose throughout, especially in the inflorescence; leaves narrow, grass-like, basal; inflorescence bearing 1 or several small yellow flowers, cymose; perianth segments 6, barely united at the base, without a tube, regular, the outer usually somewhat sepal-like; stamens 6, the filaments united to the base of the perianth; pistil 3-celled, inferior, more or less truncate at the tip, without a beak; fruit a capsule, dehiscing by longitudinal slits.

- a. Leaf sheaths at length disintegrating into stiff persistent fibers..... 1. *H. HUMILIS*  
 aa. Leaf sheaths wholly disintegrating, not fibrous..... 2. *H. DECUMBENS*

1. *HYPOXIS HUMILIS* HBK. Nov. Gen. & Sp. 1:286. 1816; Brackett, loc. cit. 144. 1923.

*Niobe pratensis* Willd. ex Schult. f. Syst. Bot. 7:762. 1830.



Fig. 11. *Hypoxis humilis*

Small scapose herbs; corm globose to sub-cylindric, 5-11 cm. thick, surrounded by the bristle-like fibers of disintegrated leaves; leaves linear, 0.8-2.8 cm. broad, 6-35 cm. long, rather densely pilose; peduncles 1- to 2-flowered, 1-18 cm. long, slender, pilose; perianth segments narrowly elliptic, 3-5 mm. long; capsules subglobose, 3-6 mm. long.

Mexico to Argentina, in llanos at fairly high elevations.

CHIRIQUÍ: Llanos del Volcán de Chiriquí, Allen 997.

2. *HYPOXIS DECUMBENS* L. Pl. Jam. Pugill. 11. 1759; Brackett, loc. cit. 129. 1923.

*Hypoxis caricifolia* Salisb. Prodr. 248. 1706.

*Hypoxis gracilis* Lehm. apud Schult. f. Syst. Bot. 7:764. 1830.

*Hypoxis decumbens* var. *mexicana* (Schult. f.) Jennings in Ann. Carn. Mus. 11:97. 1917.

Small scapose herbs; corm cylindric to ellipsoid, 0.7-2.0 cm. long, the surrounding leaf sheaths membranous, not fibrous; leaves linear to lanceolate, 1-4 dm. long, 2-12 mm. broad, sparsely pilose to glabrate; peduncles 1- to 4-flowered, filiform, 2-20 cm. long; perianth segments lanceolate, 4-10

mm. long; capsule club-shaped, cylindric or slenderly ellipsoid, 0.6–1.7 cm. long.

Mexico to Brazil; Antilles, in meadows, llanos, and savannas.

CHIRIQUÍ: Piedro de Lino, Killip 3570; Llanos del Volcán, Seibert 336.

#### 5. CURCULIGO Gaertn.

CURCULIGO Gaertn. Fruct. et. Sem. 1:63. *t.* 16, *f.* 11. 1788.

*Aurota* Raf. Fl. Tellur. 3:61. 1836.

Scapose herbs from corm-like rhizomes, scatteringly pilose throughout; leaves narrow, grass-like (in Panama), basal; inflorescence mostly 1-flowered; perianth segments yellowish, 6, equal, barely united at the base but appearing to have a long tube because of the narrow beak of the ovary; stamens 6, the filaments united to the base of the perianth; pistil 3-celled, inferior, provided with a long narrow beak; fruit rather fleshy and indehiscent.



Fig. 12

*Curculigo scorzoneraefolia*

1. CURCULIGO SCORZONERAEFOLIA (Lam.) Baker in Jour. Linn. Soc. Bot. 17:124. 1878; Brackett in Rhodora 25:160. 1923.

*Hypoxis scorzoneraefolia* Lam. Encyc. Meth. Bot. 3:183. 1789.

Small scapose herbs, scatteringly pilose throughout; leaves linear to lanceolate, 10–35 cm. long, 1.5–14 mm. broad; peduncles mostly 1-flowered, 5.0–8.5 cm. long; perianth segments lanceolate, 0.7–1.4 cm. long, pilose without; ovary (including the narrow beak) 2–4 cm. long.

Mexico to South America; Antilles, savannas and llanos.

PANAMÁ: Pacora, Woodson, Allen & Seibert 740.

#### 6. CRINUM L.

CRINUM L. Sp. Pl. 291. 1753.

*Tanghekolli* Adans. Fam. Pl. 2:57. 1763.

*Scadianus* Raf. Atl. Jour. 164. 1833.

*Liriamus* Raf. Fl. Tellur. 4:23. 1836.

*Crinopsis* Herb. Amaryll. 270. 1837.

*Pancratium-Crinum* Herb. ex Steud. Nom. 2:250. 1841.

Usually rather massive scapose herbs with tunicated bulbs and basal, usually succulent leaves; inflorescence scapose, umbelliform, bearing few to several showy, sessile or subsessile flowers subtended by 2 or more spathaceous bracts; perianth salverform, with a long slender tube and a spreading limb of 6 more or less equal lobes, white, or more or less deeply flushed with red or purple; stamens 6, inserted at the base of the perianth lobes; filaments terete or subterete, slender; anthers versatile; fruit a rather fleshy, asymmetrical capsule, tardily dehiscent.

- a. Leaves lorate or ensiform, greatly elongate, sessile.  
 b. Perianth lobes erect or ascending, linear, nearly as long as the tube; flowers with short but distinct pedicels. 1. *C. LONGIFLORUM*  
 bb. Perianth lobes reflexed, lanceolate,  $\frac{1}{2}$ – $\frac{1}{3}$  as long as the tube; flowers sessile. 2. *C. ERUBESCENS*  
 aa. Leaves oblong-elliptic, narrowed to a conspicuous subpetiolar base; perianth lobes widely spreading, elliptic-oblong, about  $\frac{1}{3}$  as long as the tube; flowers shortly pedicellate. 3. *C. DARIENENSIS*

1. *CRINUM LONGIFLORUM* Herb. Amaryll. 271. 1837.

*Amaryllis longifolia* var. *longiflora* Ker in Bot. Reg. pl. 303. 1818.

Leaves rather broadly ensiform, narrowly acuminate, 6–9 dm. long, 6–8 cm. broad toward the base; flowering scape stout, about 8 dm. tall, involucre bracts narrowly lance-trigonal, 6–9 cm. long, bearing 4–8 showy white flowers usually deeply flushed with purple in the tube; flowers with stout pedicels 2–3 cm. long; perianth tube 8–9 cm. long, very slender, the lobes linear, about 9 cm. long, erect or ascending; stamens widely exserted, the filaments red.

Very widely cultivated, considered by Dean Herbert to be a native of Jamaica and Antigua.

BOCAS DEL TORO: Little Bocas, von Wedel 2531; Western River, von Wedel 2789a.

Widely known as *Lirio* in Panama. The specimens cited above probably are escapes.

2. *CRINUM ERUBESCENS* Ait. Hort. Kew. 1:413. 1789.

*Crinum Commelini* Jacq. Hort. Shoen. 2:40. pl. 202. 1798.

*Crinum Kuntbium* M. Roem. Fam. Nat. Syn. 4:80. 1847.



Fig. 13. *Crinum darienensis*

Bulb ovoid, 7–10 cm. in diameter; leaves basal, numerous, lorate, gradually acuminate, 3–5 dm. long, 5–7 cm. broad; flowering scape stout, 3–4 dm. long, involucre bracts lance-trigonal, 6–8 cm. long, bearing 4–12 flowers; flowers white, usually deeply tinged with purple without, sessile; perianth tube 15–20 cm. long, very slender, the lobes lanceolate, 7–8 cm. long; stamens greatly exserted, the filaments scarlet or purple.

Widespread in tropical America, and frequently cultivated. In Panama apparently spontaneous in wet soil beside streams at rather low elevations.

BOCAS DEL TORO: Río Cricamola, Woodson, Allen & Seibert 1910. CANAL ZONE: Barro Colorado Island, Seibert 567.

Popularly known as *Lirio*.



3. *CRINUM DARIENENSIS* Woodson in Ann. Missouri Bot. Gard. 25:824. 1938.

Bulbs subcylindrical, 12-13 cm. long, 2-3 cm. thick, densely tunicated; leaves basal, oblong-elliptic, acute to shortly acuminate, gradually produced into a conspicuous subpetiolar base, 20-30 cm. long, the blade 4-6 cm. broad; flowering scape 15-20 cm. long, relatively slender, the involucral bracts ovate-trigonal, 5-7 cm. long, 3- to 5-flowered; flowers white, or very faintly tinged with pink; pedicels 0.5 cm. long or scarcely manifest; perianth tube very slender, 15-20 cm. long, the lobes lanceolate to oblong-elliptic, 5-6 cm. long, spreading; stamens widely exserted, the filaments purple.

Panama, in humid forest.

COCLÉ: El Valle de Antón, Allen 1659. DARIÉN: between Pinogana and Yaviza, Allen 264.

7. *ZEPHYRANTHES* Herb.

*ZEPHYRANTHES* Herb. App. Bot. Reg. 7:36. 1821; Herb. Amaryll. 170. 1837;

Baker, Handb. Amaryll. 30. 1888.

*Pyrolirion* Herb. App. Bot. Reg. 7:37. 1821.

*Habranthus* Herb. in Bot. Mag. pl. 2464. 1824.

*Mesochloa* Raf. Fl. Tellur. 4:10. 1836.

*Plectronema* Raf. loc. cit. 1836.

*Pogonema* Raf. loc. cit. 1836.

*Argyropsis* M. Roem. Fam. Nat. Syn. 4:125. 1847.

*Arviela* Salisb. Gen. Pl. Fragm. 135. 1866.

*Atamosco* Greene, Pittonia 3:187. 1897.

Delicate, glabrous, acaulescent herbs arising from underground bulbs; leaves linear, contemporary with the flower; scape 1-flowered, consisting of an elongate peduncle bearing terminally a 1-valved spathe from which arises the solitary pedicel; perianth funnel-shaped with a short tube and subequal lobes, stamens 6, glabrous; filaments filiform, inserted in the throat or at the base of the perianth tube; anthers linear, versatile, attached below the middle; style slender, from  $\frac{1}{2}$  as long to almost as long as the perianth; stigma trifid or trilobed; capsule ovate, 3-valved, many seeded.



Fig. 14  
*Zephyranthes citrina*

- a. Flowers yellow; stigma subcapitate; perianth tube manifest; filaments inserted at top of perianth tube. 1. *Z. CITRINA*
- aa. Flowers pink or white; stigma trifid; perianth tube almost obsolete; filaments inserted near base of perianth.
- b. Flowers pink, short, about 3 cm. long; petals obtuse; leaves usually one pair, no longer than the peduncle. 2. *Z. ROSEA*
- bb. Flowers white, about 3.5 cm. long; petals acute; leaves usually 4, often longer than the scape. 3. *Z. TUBISPATHA*

1. *ZEPHYRANTHES CITRINA* Baker in Bot. Mag. pl. 6605. 1882.

*Z. Eggersiana* Urban, Symb. Ant. 5:292. 1907.

Leaves linear, up to 35 cm. long and about 2 mm. wide; peduncle thicker than in the other two species, about 16 cm. long; spathe about 2 cm. long, its tube about 8 mm. long, attenuate on one side into an uncleft tip; pedicel 2-3 cm. long; perianth yellow, the tube manifest, almost 1 cm. long, the lobes elliptic-obovate, about 2.5 cm. long and 8 mm. wide, obtuse apically; filaments inserted at the top of the perianth tube, about 12 mm. long; style about 16 mm. long, bearing a stout 3-lobed, subcapitate stigma.

Vaguely referred to as growing in tropical America; reported from Cuba and Trinidad. The type supposedly came from British Guiana. The plant is now cultivated in Florida and perhaps elsewhere. In Panama the species has been collected only from "Maccau Hills" on the inhabited Columbus Island where it was growing in association with the other known Panamanian species, and may possibly have been introduced.

BOCAS DEL TORO: Isla Colón, alt. 0-120 m., von Wedel 543.

2. *ZEPHYRANTHES ROSEA* Lindl. in Bot. Reg. pl. 821. 1824; Herb. in Bot. Mag. pl. 2537. 1825.

*Amaryllis rosea* Spreng. Syst. 4. Cur. Post. 133. 1827.

*A. carnea* Schult. f. Syst. Bot. 7:799. 1830.

Leaves linear, up to 12 cm. long, about 3 mm. wide; peduncle about 10 cm. long, bearing at its apex a spathe about 17 mm. long; spathe tube cylindric, about 1 cm. long, attenuate on one side into a deeply cleft tip; pedicel slender, up to 3 cm. long; perianth pink, the tube very short, less than 5 mm. long, the lobes obovate or oblanceolate, almost 3 cm. long, 6-8 mm. wide, obtuse apically; filaments inserted at the base of the tube, about 14 mm. long; anthers linear, versatile, attached below the middle, about 6 mm. long; style slender, up to 2.5 cm. long, bearing a trifid stigma; stigma lobes linear, about 2 mm. long.

*Zephyranthes bifolia* M. Roem. (Fam. Nat. Syn. 4:125. 1847) was for many years considered as a synonym for this species, but has recently been reinstated as a valid species by Hume (Bull. Torrey Bot. Club 62:405. 1935).

Known from the West Indies and originally described from a Cuban specimen; probably occurring generally in the American tropics although, as with other species of this genus, it is difficult to know whether the plant is native or introduced in a given region.

BOCAS DEL TORO: Isla Colón, alt. 0-120 m., von Wedel 544.

3. *ZEPHYRANTHES TUBISPATHA* Herb. App. Bot. Reg. 7:96. 1821.

*Amaryllis tubispatha* Gawl. in Bot. Mag. pl. 1586. 1813.

*Amaryllis nervosa* HBK. Nov. Gen. & Sp. 1:278. 1816.

?*Zephyranthes Mesocbloa* Herb. in Bot. Reg. pl. 1345, 1361. 1830.

*Zephyranthes nervosa* Herb. Amaryll. 172. 1837.

*Zephyranthes Lindleyana* Herb. loc. cit. 174. pl. 35. fig. 5. 1837.

Leaves linear, up to 18 cm. long, about 4 mm. wide; peduncle about 12 cm. long, bearing at its apex a spathe about 2 cm. long; spathe tube cylindric, about

1 cm. long, attenuate on one side into a deeply cleft tip; pedicel slender, up to 3.5 cm. long; perianth white, the tube very short, less than 5 mm. long, the lobes obovate or oblanceolate, almost 3.5 cm. long, 6-8 mm. wide, acute apically; filaments inserted at the base of the tube, about 17 mm. long; anthers linear, versatile, attached below the middle, about 6 mm. long; style slender, up to 2.5 cm. long, bearing a trifold stigma; stigma lobes linear, about 2 mm. long.

Known from Argentina (?) and Jamaica (fide Bot. Mag. loc. cit.); specimens of probably this species are known from Tobago and northern Central America. Like the other two species, this plant has been introduced into Florida and probably elsewhere.

BOCAS DEL TORO: Isla Colón, alt. 0-120 m., von Wedel.

This Wedel plant appears to be but a variety or form of the preceding species, in association with which it was found growing. However, the plant matches the illustration of *Z. tubispatha* in the Bot. Mag. almost perfectly, but has slightly smaller dimensions than those given for the species by Baker in his 'Handbook of Amaryllideae.' It seems best to consider the Wedel specimen as *Z. tubispatha*, distinct from *Z. rosea*, until further collections can settle its position definitely.

#### 8. EUCHARIS Planch.

*EUCHARIS* Planch. ex Linden, Cat. 8:3. 1853.

*Mathieus* Klotzsch in Otto & Dietr. Allg. Gartenzeit. 21:337. 1853.

Moderate-sized scapose herbs with tunicated bulbs and broadly laminate, narrowly petiolate basal leaves; inflorescence scapose, umbelliform, involucre, bearing few to several showy pedicellate flowers; perianth infundibuliform, with a narrowly funnel-shaped tube and a spreading limb of 6 broad ovate or ovate-lanceolate segments; stamens inserted at the throat of the perianth tube, shorter than the lobes; filaments broadly dilated and petaloid at the base, forming a conspicuous corona of free or united segments; anthers versatile; pistil inferior, 3-celled; fruit a tardily dehiscent, somewhat fleshy capsule containing a few large ovoid seeds.



Fig. 15. *Eucharis candida*

- a. Perianth about 10-11 cm. long, the limb about 9-10 cm. broad; corona segments with lateral auricles. 1. *E. CANDIDA*
- aa. Perianth about 6-7 cm. long, the limb about 4.5-5.0 cm. broad; corona segments triangular-dentiform, without lateral auricles. 2. *E. BOUCHEI*

1. *EUCHARIS CANDIDA* Planch. in Fl. Serres pl. 788. 1853.

Bulbs ovoid, 3.5–4.0 cm. long or more; leaf-blades broadly oval, shortly and abruptly acuminate, 9–15 cm. long, 9–10 cm. broad, obtusely narrowed to a slender petiole 15–20 cm. long; flowering scape 3–5 dm. long, rather stout, sub-compressed, bearing 6–10 handsome white flowers at the tip; perianth tube 6–7 cm. long, about 0.1 cm. in diameter at the base, dilating abruptly to a conical throat about 1 cm. broad, the lobes broadly ovate, obtuse, 4–5 cm. long; corona erect, about 1 cm. tall, composed of 5 laterally auriculate segments united for about half their length, terminated by the filiform staminal filaments about 1 cm. long.

Colombia and Panama, in highland forests. Frequently cultivated and possibly an escape in Panama.

COCLÉ: El Valle de Antón, *Hunter & Allen* 338.

An extremely handsome Amaryllid popularly known as *Eucaristo* and *Eucharistia*.



Fig. 16. *Eucharis Bouchei*

2. *EUCHARIS BOUCHEI* Woodson & Allen in Ann. Missouri Bot. Gard. 24:181. 1937.

Bulbs ovoid, about 4 cm. long; leaf-blades broadly oval to ovate-lanceolate, abruptly acuminate, 20–35 cm. long, 11–15 cm. broad, rather abruptly narrowed to the slender petiole 20–30 cm. long; flowering scape 30–50 cm. long, bearing 4–8 rather showy white flowers at the tip; perianth tube 3.0–4.5 cm. long, about 0.1 cm. wide at the base, abruptly widened to a conical throat about 0.5–0.7 cm. in diameter, the lobes ovate to oblong-ovate, acute to obtuse, 2.0–2.5 cm. long; corona erect, about 0.8 cm. tall, composed of 5 acutely tapered segments united for about half their length.

Panama, in highland forest. Perhaps the same species is represented in Costa Rica by *E. himeroessa* Sandw. nom. nud. apud Standl. Fl. Costa Rica 1:176. 1937.

COCLÉ: El Valle de Antón, *Allen* 120, 1228, 2063, *Seibert* 466.

9. *PANCRATIUM* L.

*PANCRATIUM* L. Sp. Pl. 290. 1753.

*Hymenocallis* Salisb. in Trans. Hort. Soc. Lond. 1:338. 1812.

*Nemepiodon* Raf. Fl. Tellur. 4:22. 1836.

*Siphotoma* Raf. loc. cit. 1836.

*Tomodon* Raf. loc. cit. 1836.

*Choretis* Herb. Amaryll. 219. t. 35. 1837.

*Hymenocalyx* Herb. ex Houll. in Rev. Hort. 40:418. 1869.

Moderately large scapose herbs with tunicated bulbs and rather fleshy basal leaves; inflorescence scapose, umbelliform, involucre, bearing few to several showy sessile flowers; perianth salverform, with a very narrow tube and six spreading narrowly linear lobes; stamens inserted on the margin of a very conspicuous turbinate corona, the free portion of the filaments long and very slender; anthers linear, versatile; ovary inferior, 3-celled; fruit a fairly large, tardily dehiscent capsule.

1. *PANCRACTIUM LITTORALE* Jacq. Select. Stirp. Amer. Hist. 99. t. 179, fig. 94. 1766.



Fig. 17. *Pancratium littorale*

*Hymenocallis littoralis* (Jacq.) Salisb. in Trans. Hort. Soc. Lond. 1:338. 1812.

*Pancratium americanum* Mill. Gard. Dict. ed. 8. no. 7. 1768.

*Hymenocallis Dryandri* M. Roem. Fam. Nat. Syn. 4:175. 1847.

*Hymenocallis disticha* Herb. App. Bot. Reg. 7:44. 1821.

*Hymenocallis acutifolia* M. Roem. loc. cit. 174. 1847.

*Hymenocallis Staplesiana* M. Roem. loc. cit. 175. 1847.

*Hymenocallis americana* (L.) Salisb. ex Standl. Fl. Pan. Canal Zone, 115. 1928, *sphalm.*

Bulbs ovoid, 5–8 cm. long; leaves lorate, sessile, gradually acute to obtuse, 6–8 dm. long, 2–3 cm. broad, basal; flowering scape compressed, 3–6 dm. long, bearing numerous showy white flowers at the tip; perianth tube 15–20 cm. long, about 0.15 cm. thick, the lobes narrowly linear, 9–12 cm. long, reflexed; corona broadly funnel-shaped, 2.0–2.5 cm. deep, about 3–3.5 cm. in diameter at the margin; staminal filaments very slender, 4.5–5.5 cm. long; style about equalling the anthers.

Widely distributed from the southeastern United States southward throughout the Antilles and tropical America generally; very common on sea beaches and coastal marshes.

BOCAS DEL TORO: Water Valley, von Wedel 1415. PANAMÁ: Trapiche Island, Bay of Panama, Allen 2625.

*Pancratium* is the "Spider Lily" of the southeastern United States.

## VELLOZIACEAE

### 1. VELLOZIA Vand.

VELLOZIA Vand. Fl. Lusit. & Bras. Sp. 32. t. 2. 1788.

*Vellozia* Spreng. Syst. 3:338. 1826, *sphalm.*

*Vellozoa* Lem. Jard. Fleur. 4: t. 390. 1853.



Shrubby plants with rather stout, dichotomously branched stems covered with the persistent bases of fallen leaves; leaves crowded at the tips of the branches, stiff and narrow; flowers solitary on long peduncles in the axils of the upper leaves, perfect, regular, sometimes rather showy; perianth segments 6, free, the outer occasionally somewhat calycine; stamens 6 or more; filaments united to the base of the perianth segments; anthers basifixed, longitudinally dehiscent; pistil inferior, 3-celled, the style slender, with a capitate or 3-lobed stigma; fruit a loculicidal capsule; seeds numerous, borne on stalked axile placentas.

1. *VELLOZIA PANAMENSIS* Standl. in Jour. Wash. Acad. Sci. 15:457. 1925.

Leaves linear, 8–25 cm. long, 0.5–0.9 cm. broad, subulate-attenuate, glabrous above, white-pilose beneath, the margins cartilaginous, smooth; flowering scapes 1–2, stout, 4–6 cm. high, densely covered with stipitate glands; perianth tube nearly 5 cm. long, densely covered with stipitate glands, the lobes linear, about 1 cm. long, glandular without; stamens 12; style filiform, twisted above, exceeding the perianth; capsule 1.5 cm. long, subglobose, densely covered with stout, dark, stipitate glands.

Panama, in highland forest.

CHIRIQUÍ: Cerro Vaca, Pittier 5352.

## DIOSCOREACEAE<sup>1</sup>

By C. V. MORTON

### 1. DIOSCOREA L.

*DIOSCOREA* L. Sp. Pl. 1032. 1753; C. V. Morton, Carn. Inst. Wash. Publ. 461:241–253. 1936.

Twining vines; leaves simple, alternate or opposite, petiolate, usually cordate at base, acuminate, entire or lobate, glabrous or pubescent with simple hairs, not tendril-bearing, palmately veined, the secondary veins reticulate; flowers regular, unisexual (dioecious); perianth segments 6, similar, equal, ovate to linear-oblong, connate at base; stamens 6, or 3 (rarely alternating with 3 staminodia), borne on perianth segments or on a central disk, free or connate; anthers small, free, opening by longitudinal slits, introrse or extrorse; rudimentary ovary present or absent in the staminate flowers; pistillate flowers with or without minute staminodia; ovary inferior, linear or oblong, 3-celled; ovules 2 in each cell, superposed, pendulous, anatropous; styles 3, short; fruit a loculicidally dehiscent, 3-valved capsule; seed winged at base or all around.

The cultivated yams, often called *ñame* in tropical America, belong to this genus. The following cultivated species, and perhaps others, may be naturalized to some extent in Panama: *Dioscorea alata* L., *D. bulbifera* L., and *D. cayennensis* Lam. Since the cultivated plants are usually sterile, these species have been placed

<sup>1</sup> Published by permission of the Secretary of the Smithsonian Institution.

in the alternative key based on sterile specimens. No descriptions of them are provided.

A specimen of an additional native species, probably undescribed, has been collected near Cana, but the material at hand is in fruit only.

- a. Fertile stamens 6.
  - b. Leaf blades 3- to 5-lobed; stems and petioles winged; rhachis and perianth segments pubescent; stems twining to the left..... 7. *D. TRIFIDA*
  - bb. Leaf blades entire.
    - c. Rhachis, perianth segments and pedicels pubescent; leaves alternate, not pellucid-lineolate.
      - d. Leaf blades glabrous beneath, ovate-lanceolate; stems twining to the right; filaments central, partly connate; anthers opening outwardly..... 1. *D. SAPINDOIDES*
      - dd. Leaf blades densely soft-pilose beneath, suborbicular; stems twining to the left; filaments borne on the perianth segments, free from each other; anthers opening inwardly..... 8. *D. CYMOSULA*
    - cc. Rhachis, perianth segments and pedicels glabrous; leaves and stems glabrous.
      - d. Leaves partly opposite or subopposite, conspicuously pellucid-lineolate by transmitted light; stems bearing spines at base of the larger leaves; stems twining to the left; flowers solitary, sessile; anthers opening inwardly..... 2. *D. UROPHYLLA*
      - dd. Leaves alternate, not pellucid-lineolate; stems unarmed, twining to the right; flowers not solitary, or if so, not sessile; anthers opening outwardly.
        - e. Filaments slender (0.5 mm. long); leaf blades small (not over 4 cm. long), merely rounded at base, 5-nerved..... 5. *D. PANAMENSIS*
        - ee. Filaments obsolete; leaf blades larger, cordate at base, 9-nerved..... 9. *D. MACROSTACHYA*
  - aa. Fertile stamens 3; plants wholly glabrous; leaves alternate; stems unarmed.
    - b. Anther cells separated by a broad connective; staminodia 3, bifid; flowers sessile, fasciculate..... 10. *D. POLYGONOIDES*
    - bb. Anther cells contiguous; staminodia none; flowers pedicellate, solitary or rarely in clusters.
      - c. Seeds winged at base only.
        - d. Filaments very short, inserted on a fleshy, central disk; perianth purple; flowers solitary or clustered..... 6. *D. RACEMOSA*
        - dd. Filaments obvious, conspicuously enlarged and connate at base; perianth green; flowers always solitary.
          - e. Capsules acute..... 4. *D. LEPIDA*
          - ee. Capsules rounded at apex..... 3. *D. CONVULVULACEA*
      - cc. Seeds winged all around; staminate flowers borne in stalked clusters along rhachis..... 11. *D. STANDLEYI*

#### ALTERNATIVE KEY BASED ON STERILE OR FRUITING PLANTS

- a. Stems and petioles winged.
  - b. Leaf blades deeply 3- to 5-lobed; rhachis and perianth segments pubescent; stems twining to the left..... 7. *D. TRIFIDA*
  - bb. Leaf blades not lobed; rhachis and perianth segments glabrous; stems twining to the right..... *D. ALATA*
- aa. Stems and petioles not winged; leaf blades entire.
  - b. Leaves opposite, at least in part; stems spiny at base of the larger leaves; leaves pellucid-lineolate.
    - c. Stems twining to the left; capsule valves woody..... 2. *D. UROPHYLLA*
  - cc. Stems twining to the right..... *D. CAYENNENSIS*
  - bb. Leaves alternate; stems unarmed; leaves not pellucid-lineolate.
    - c. Rhachises and ovaries densely pubescent; stems and petioles more or less pubescent.
      - d. Stems twining to the right; leaf blades glabrous beneath, ovate-lanceolate..... 1. *D. SAPINDOIDES*

- dd. Stems twining to the left; leaf blades densely soft-pilose beneath, suborbicular..... 8. *D. CYMOSULA*
- cc. Rhachises and ovaries glabrous or merely scabrous; leaves and stems glabrous.
- d. Leaf blades small (not over 4 cm. long), lanceolate or ovate-lanceolate, rounded at base, 5-nerved; stems twining to the right..... 5. *D. PANAMENSIS*
- dd. Leaf blades larger, broadly ovate or suborbicular, cordate at base, 9- to 11-nerved.
- e. Seeds winged at base only.
- f. Stems twining to the left..... *D. BULBIFERA*
- ff. Stems twining to the right.
- g. Capsules acute..... 4. *D. LEPIDA*
- gg. Capsules rounded at apex..... 3. *D. CONVULVULACEA*
- ggg. Capsules unknown..... 6. *D. RACEMOSA*
- ee. Seeds winged all around.
- f. Stems twining to the left; leaf blades abruptly short-acuminate; capsules about 1.7 cm. long..... 10. *D. POLYGONOIDES*
- ff. Stems twining to the right.
- g. Capsules 2.5-3 cm. long; stigmas subsessile..... 9. *D. MACROSTACHYA*
- gg. Capsules about 1.5 cm. long; stigmas borne on style 1 mm. long..... 11. *D. STANDLEYI*

1. *DIOSCOREA SAPINDOIDES* Presl, Rel. Haenk. 1:33. 1830.

*Dioscorea costaricensis* Knuth, in Notizbl. Bot. Gart. Berlin 7:189. 1917.

*Dioscorea pilosiuscula* var. *panamensis* Knuth, in Engl. Pflanzenz. IV. 43:66. 1924.

Stems slender, dextrorsely climbing, sparingly pilosulous, glabrate in age; leaves alternate; petiole up to 8 cm. long, sparingly pilosulous; larger leaf blades



Fig. 13. *Dioscorea sapindoides*

ovate-lanceolate, up to 19 cm. long and 9.5 cm. wide, long-acuminate, deeply cordate at base, the central part 5-nerved, the basal lobes each with 4 nerves, glabrous on both sides, the texture thin, the smaller leaf blades rather similar but relatively much narrower; staminate inflorescences 1-3 in an axil, the rhachis 8-30 cm. long, simple or rarely branched, sparsely pilosulous, very slender, the flowers borne in numerous short racemes 6-7 mm. long, these 3- to 8-flowered; pedicels filiform, 2-4 mm. long, densely pilosulous, each bearing a small, brownish bract at base; perianth segments narrowly lanceolate, erect, 1.5-1.8 mm. long, densely pilosulous externally; stamens 6, all fertile, the filaments connate for 0.5 mm. into tube, the free parts 0.5



mm. long, recurved; anthers about 0.25 mm. wide, extrorse; pistillate spikes elongate, 20 cm. long or more, solitary or paired in the axils, the rhachis pilosulous; ovaries and perianth segments pilosulous; fruits oblong, flat, 2 cm. long and 1.1 cm. wide, glabrate at maturity.

Mexico, Costa Rica and Panama.

CANAL ZONE: Quebrada Salamanca, Dodge, Steyermark & Allen 16992; Gamboa, Pittier 4803; Chepo, Pittier 4463, 4514 (TYPE of *D. pilosiuscula* var. *panamensis*); Ancón Hill, Killip 12114; Empire Railway Station, Hayes 303, 321 (both teste Knuth). CHIRIQUÍ: Cerro de la Plata, near San Felix, Pittier 5170; PANAMÁ: Bejuco, Allen 984; Las Sabanas, Heriberto 199; La Chorrera, Paul 503.

2. *DIOSCOREA UROPHYLLA* Hemsl. Biol. Centr.-Amer. Bot. 3:361. 1884.

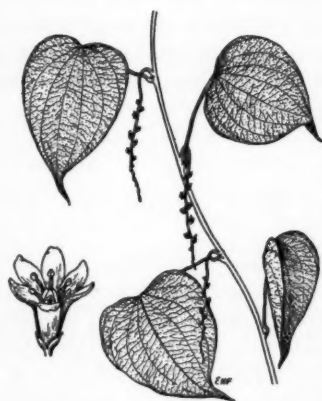


Fig. 19. *Dioscorea urophylla*

Stems climbing sinistrorsely, glabrous, bearing spines at base of large leaves; leaves often opposite or subopposite; petioles elongate, up to 8 cm. long, often nearly as long as blade, glabrous; leaf blades ovate, up to 9 cm. long and 7 cm. broad, acuminate, truncate at base, 9-nerved, glabrous, membranous, entire, conspicuously pellucid-lineolate; staminate spikes 8–20 cm. long, 1–3 in an axil, unbranched or conspicuously branched, the rhachis glabrous; flowers solitary, sessile; perianth segments about 3 mm. long, connate at base about 0.7 mm., fleshy, glabrous; stamens 6, all fertile, inserted on perianth lobes, the filaments about 0.6 mm. long, the anthers about 0.5 mm. long, introrse; rudimentary ovary large; pistillate

spikes solitary, axillary, 10–20 cm. long; capsules oblong, 23–30 mm. long, 13–16 mm. wide, coriaceous, tuberculate, especially near middle of valves; seeds about 2 cm. long (including wing) and 6 mm. wide, winged on lower end.

Confined to Panama.

CANAL ZONE: Fort Kobe Road, Woodson, Allen & Seibert 1424; Miraflores Lake, G. White 172; Gamboa, Pittier 3705; Rio Chagres between Rio Pequeni and Rio Indio, Steyermark & Allen 16777a; Las Sabanas, Pittier 6680; Ancón Hill, Seibert 396, Greenman & Greenman 5130; Corozal, Standley 27337; between Corozal and Ancón, Pittier 6772. COCLÉ: between Aguadulce and Antón, Woodson, Allen & Seibert 1204. PANAMÁ: Panama City, Riley 144, Macbride 2611; Sabana de Panamá, Gervais 154; Punta Paicilla, Standley 26232; Rio Tapia, Juan Díaz Region, Maxon & Harvey 6697.

As pointed out by me (Carn. Inst. Publ. 461:248. 1926), *D. urophylla* belongs to subgenus *Helmia*, sect. *Chondrocarpa*, and not to *Eudioscorea*, sect. *Macrogynodium*, where it was placed by Knuth. It is undoubtedly the same as the plant reported from Panama by Knuth (Engl. Pflanzenr. IV. 43:84. 1924) as *D. samydea* var. *corcovadensis* Uline. *D. urophylla* is surely very close to the Brazilian *D. samydea* Griseb., and may be conspecific. The type is Hayes 190 from Panama.

3. *DIOSCOREA CONVOLVULACEA* Schlecht. & Cham. var. *GLABRA* (Hemsl.) Uline ex Knuth, in Engl. Pflanzenr. IV. 43:99. 1924.

*Dioscorea capillaris* var. *glabra* Hemsl. Biol. Centr.-Amer. Bot. 3:354. 1884.

Stems very slender, climbing dextrorsely, glabrous, not spiny; leaves alternate; petioles 1.5–4 cm. long, glabrous; leaf blades ovate, up to 14 cm. long and 13 cm. wide (the upper much smaller), acuminate, entire, deeply cordate at base, usually 11-nerved, glabrous; staminate racemes 1–3 in an axil, unbranched, usually about 10 cm. long, the rhachis slender, glabrous; flowers solitary, pedicellate, the pedicels 2–3 mm. long, glabrous; perianth segments oblong, about 1.8 mm. long, reflexed, free, glabrous; stamens 3, inserted on base of perianth segments, the filaments about 1 mm. long, much enlarged at base and connate with each other, the anthers minute, upwardly dehiscent; staminodia none; rudimentary ovary none; pistillate spikes simple, usually 10 cm. long or less; capsules oblong, rounded at apex, about 18 mm. long and 8 mm. wide, glabrous; seeds about 6.5 mm. long (including wing) and 2.2 mm. wide, winged at basal end.

Mexico to Panama. Trinidad (teste Knuth).

COCLÉ: vicinity of El Valle, Allen 739.



Fig. 20  
*Dioscorea lepida*

4. *DIOSCOREA LEPIDA* Morton in Carn. Inst. Publ. 461:248. 1926.

Stems climbing dextrorsely, glabrous, unarmed; leaves alternate; petioles elongate; leaf blades ovate, up to 12 cm. long and 7.3 cm. wide, long-acuminate, cordate at base, glabrous, membranous, 9-nerved; staminate flowers unknown; capsules green, narrowly oblong, 10–16 mm. long, 5–7 mm. wide, acute, glabrous, soon dehiscent; seeds 7–8 mm. long (including wing), 1.5 mm. wide, winged at base.

Costa Rica and Panama.

COCLÉ: Bismarck, above Penonomé, R. S. Williams 593; vicinity of El Valle, Allen 235.

It is possible that the single staminate collection referred above to *D. convolvulacea* var. *glabra* is really *D. lepida*, in which case these two species are indistinguishable except by fruiting plants.

5. *DIOSCOREA PANAMENSIS* Knuth, in Engl. Pflanzenr. IV. 43:109. 1924.

Stems slender and delicate, unarmed, climbing dextrorsely, glabrous; leaves alternate; petioles 0.5–1 cm. long, glabrous; leaf blades lanceolate or ovate-lanceolate, very small, up to 4 cm. long and 2 cm. wide, acuminate, rounded at base, entire, membranous, glabrous, 5-nerved; staminate racemes 1 or 2 in an axil, up to 15 cm. long, unbranched, the rhachis glabrous; flowers solitary or in short, few-flowered racemes, pedicellate,

the pedicels 1.5–2.5 mm. long, glabrous; perianth segments lanceolate, about 1.5 mm. long, connate at base, reflexed; stamens 6, all fertile, central; filaments slender, erect, free, about 0.5 mm. long; anthers minute, about 0.2 mm. long, extrorse; pistillate flowers and capsules unknown.

Known only from Panama.

CANAL ZONE: Ancón Hill, Killip 3050 (TYPE); Fort Kobe, Allen 2024. PANAMÁ: La Chorrera, Paul 505.

6. *DIOSCOREA RACEMOSA* (Klotzsch) Uline in Engler Bot. Jahrb. 22:430. 1897. *Helmia racemosa* Klotzsch in Otto & Dietr. Allg. Gartenzeit. 19:393. 1851.

Stems climbing dextrorsely, unarmed, glabrous; leaves alternate; petiole about 6 cm. long, glabrous; leaf blades broadly ovate, up to 11.2 cm. long and 9.8 cm. wide, acuminate, lightly cordate at base, membranous, entire, glabrous, 9- to 11-nerved; staminate inflorescences 2 or 3 in an axil, up to 17 cm. long, unbranched; flowers solitary or paired or rarely in threes, pedicellate, the pedicels 1–1.5 mm. long; perianth segments purple, ovate-oblong, 1.75 mm. long, spreading, glabrous; stamens 3; staminodia none; filaments very short, distinct, inserted on a fleshy, central disk, the anthers small, upwardly dehiscent; rudimentary style none; pistillate flowers and capsules unknown.

Costa Rica and Panama.

BOCAS DEL TORO: Fish Creek, von Wedel 2275. COCLÉ: vicinity of El Valle, Allen 1258. PANAMÁ: Campana, Allen 1869.

*Dioscorea borealis* Morton, of Costa Rica, was originally described (Jour. Wash. Acad. Sci. 27:304. 1937) as belonging to the section *Centrostemon*. This was due to erroneous observation of the androecium. It really belongs in section *Cycladenium*, and is very close to *D. racemosa* var. *Hoffmannii* Uline from description. This variety may be specifically distinct from typical *D. racemosa*, the type of which was collected by Warszewicz in "Central America."

7. *DIOSCOREA TRIFIDA* L. f. Suppl. 427. 1781.

Stems climbing sinistrorsely, glabrous, at least the lower conspicuously 4-winged on the angles; leaves alternate; petioles up to 15 cm. long, winged, minutely puberulous; leaf blades variable, the larger leaves deeply 5-lobed, over 15 cm. long and wide, the smaller leaves deeply 3-lobed (the lobes all acute), deeply cordate at base, pellucid-lineolate, minutely puberulous on upper surface and along veins beneath; staminate spikes 2–5 in an axil, shorter than leaves, unbranched, the rachis subtomentose; flowers solitary (or subfasciculate?), short-pedicellate, the pedicels 1.5–2 mm. long, pilosulous; perianth segments oblong, about 2.5 mm. long, pilosulous externally; stamens 6, all fertile, borne on perianth segments, the filaments about 1 mm. long, the anthers 0.25 mm. long, introrse; rudimentary style conspicuous; ovary pilose; capsule 27 mm. long and 17 mm. wide (teste Knuth), puberulent.

Guatemala, south to Peru and Brazil. West Indies.

CANAL ZONE: Balboa, Standley 26453; between France Field and Catival, Standley 30396. PANAMÁ: Río Tapia, Standley 28120.

8. *DIOSCOREA CYMOSULA* Hemsl. Biol. Centr.-Am. Bot. 3:355. 1884.

*Dioscorea cymosula* var. *Duchassaingii* Uline ex Knuth, in Notizbl. Bot. Gart. Berlin 7:203. 1917.

*Dioscorea permollis* Knuth, in Engl. Pflanzenr. IV. 43:61. 1924.

Stems climbing sinistrorsely, not winged, unarmed, densely puberulous; leaves alternate; petioles up to 6 cm. long, puberulous; leaf blades suborbicular, about 10 cm. long and 9 cm. wide, sharply acuminate, deeply cordate at base, not lobed, not pellucid-lineolate, puberulous above, densely soft-pilosulous beneath, 13- to 17-nerved; staminate inflorescences 2-4 in an axil, unbranched, the rhachis densely pilosulous; flowers in small scorpioid racemes along rhachis, or some of them solitary, short-pedicellate, the pedicels 0.5-2 mm. long, pilosulous; perianth segments oblong, 2-2.5 mm. long, pilosulous externally; stamens 6, all fertile, borne on perianth segments, the filaments about 0.5 mm. long, slender, the anthers 0.25 mm. long, introrse, ovary densely tomentose; capsules puberulous, oblong, nearly 3 cm. long and 11 mm. wide; seeds winged all around.

Known definitely, at least in typical form, only from Panama.

CANAL ZONE: Ancón Hill, Killip 3035 (TYPE of *D. permollis*), 12086; Gamboa, Pittier 4800. COCLÉ: between Las Margaritas and El Valle, Woodson, Allen & Seibert 1761. PANAMÁ: La Chorrera, Paul 508.

The type came from Loseria, Panama (Hayes 726). The type of var. *Duchassaingii* was collected somewhere in Panama by Duchassaing. As pointed out by me (Carn. Inst. Publ. 461:250. 1936), Knuth erroneously referred his new species *D. permollis* to subg. *Helmia*, sect. *Dematostemon*, whereas it actually belongs in subg. *Eudioscorea*, sect. *Macrogynodium*.

9. *DIOSCOREA MACROSTACHYA* Benth. Pl. Hartweg. 73. 1839.

*Dioscorea Billbergiana* Kunth, Enum. Pl. 5:354. 1850.

*Dioscorea anconensis* Knuth, in Fedde Repert. Sp. Nov. 28:82. 1930.

Stems climbing dextrorsely (at least in Panama specimens), glabrous, not winged, unarmed; leaves alternate; petioles slender, up to 5 cm. long, glabrous; leaf blades ovate, up to 11 cm. long and 7.5 cm. wide (or probably the lower larger), long-acuminate, cordate at base, entire, glabrous, not pellucid-lineolate, 9-nerved; staminate inflorescences usually solitary in an axil, simple or much-branched, 8-30 cm. long, the rhachis glabrous; flowers sessile, borne in small, stalked fascicles or rarely solitary; perianth segments purple, ovate, about 1 mm. long, glabrous; stamens 6, all fertile, borne on base of perianth segments, nearly sessile, extrorse; rudimentary ovary present; ovary glabrous; capsules coriaceous, obovate, 2.5-3 cm. long, 1.5-2 cm. wide, truncate at apex, glabrous, the angles sharp.

Mexico to Panama.

BOCAS DEL TORO: vicinity of Chiriquí Lagoon, von Wedel 1223, 1273, 1488, 1604, 1760, 1778. CANAL ZONE: Ancón Hill, Killip 12085 (TYPE of *D. anconensis*), 12056, Seibert 379; Chagres, Hayes 335, 336. COCLÉ: Llano Bonito, north of Las Margaritas, Seibert 521; between Las Margaritas and El Valle, Woodson, Allen & Seibert 1732. PANAMÁ: sabanas north of Panama City, Paul 476.

Knuth referred his species *D. anconensis* to subg. *Helmia*, sect. *Dematostemon*, but examination of an isotype shows definitely that the plant belongs in *Eudioscorea* and is synonymous with *D. macrostachya* of sect. *Apodostemon*.

10. *DIOSCOREA POLYGONOIDES* Humb. & Bonpl. ex Willd. Sp. Pl. 4:795. 1806.

Stems slender, glabrous, unarmed, climbing sinistrorsely; leaves alternate; petioles up to 6 cm. long, glabrous; leaf blades ovate-orbicular, up to 11 cm. long and 8.5 cm. wide, abruptly acuminate, deeply cordate at base, thin-membranous, pale yellow-green, glabrous, 11-nerved; staminate inflorescences 2-4 in an axil, 10-30 cm. long, unbranched, or rarely a little branched, the rhachis glabrous, minutely scabrous; flowers sessile in few-flowered fascicles; perianth segments green, 1.3 mm. long, ovate, united in tube at base, glabrous; fertile stamens 3, inserted on perianth segments, the filaments short, the connective broad, the anther cells disjunct, extrorse; staminodia 3, nearly as long as the filaments, bifid at apex; rudimentary style large; pistillate spikes solitary or paired, unbranched, 15 cm. long or less, glabrous; capsules oval, about 1.7 cm. long and 1.2 cm. wide, glabrous; seeds winged all around.

Mexico to Colombia and Brazil. West Indies.

CANAL ZONE: Balboa, *Standley* 25232, 25281, 25419, 25555, 26466, 26489, 26984, 27149, 27164, 29285, 32141; Las Cascadas Plantation near Summit, *Standley* 25676, 25771; Las Cruces Trail, between Fort Clayton and Corozal, *Standley* 29049; road to Corozal, *Heriberto* 248; between France Field and Catival, *Standley* 30363; Gamboa, *Pittier* 4802.

11. *DIOSCOREA STANDLEYI* Morton in Carn. Inst. Publ. 461:252. 1936.

Stems herbaceous, glabrous, unarmed, twining dextrorsely; leaves alternate; petiole 6-7 cm. long, glabrous; leaf blades ovate, up to 12 cm. long and 10 cm. wide, acuminate, cordate at base, glabrous, entire, 9-nerved; staminate inflorescences 1 or 2 in an axil, about 15 cm. long, the rhachis glabrous; flowers borne in short cymules, the common peduncle 2-6 mm. long, the pedicels 2-4 mm. long; perianth segments green, linear-oblong, glabrous, about 2 mm. long and 0.5 mm. wide; fertile stamens 3, the filaments connate to above middle, the anthers extrorse; staminodia none; rudimentary ovary none; pistillate inflorescence solitary, unbranched, up to 11 cm. long; staminodia none; styles connate, 1 mm. long, the stigmas short; ovary glabrous; capsule about 15 mm. long and 5 mm. wide; seeds winged all around.

Costa Rica and Panama.

CHIRIQUI: Bajo Chorro, *Woodson & Schery* 652, 664; *Davidson* 61.



## IRIDACEAE

Perennial herbs from rhizomes, corms, or bulbs; leaves usually basal, frequently cauline as well, mostly narrowly linear to ensiform, sheathing at the base; equitant; flowers perfect, regular or irregular, enclosed in paired conduplicate spathes; perianth petaloid, the lobes subequal or in 2 series, free or more or less fused at the base; stamens 3, opposite the outer perianth lobes; filaments free or partially connate; anthers 2-celled, dehiscent longitudinally; ovary inferior, 3-celled with axile placentae or 1-celled with parietal placentae; style slender, 3-lobed above, sometimes winged or petaloid; fruit a loculicidally dehiscent capsule.

- a. Style branches opposite the stamens, furnished with petaloid crests; rootstock a short rhizome..... 1. NEOMARICA
- aa. Style branches alternate with the stamens, without crests.
  - b. Rootstock a tunicated corm; inner perianth lobes connivent; style branches dilated and somewhat petaloid..... 2. CIPURA
  - bb. All perianth segments free to the ovary; style branches subulate.
    - c. Rootstock a very short rhizome or virtually lacking; inflorescences simple or loosely fascicled, the flowers obviously pedicellate and the capsules exerted from the spathes..... 3. SISYRINCHIUM
    - cc. Rootstock a fairly extensive rhizome; inflorescence paniculate, the flowers virtually sessile and the capsules included within the spathes..... 4. ORTHROSANTHUS

*Moraea*, *Gladiolus*, *Tigridia*, and *Tritonia* are exotic genera occasionally encountered in cultivation.

## 1. NEOMARICA Sprague

NEOMARICA Sprague in Kew Bull. Misc. Inf. 1928:280. 1928.

*Marica* Herb. in Bot. Mag. pl. 3809. 1840, non Schreb.

*Galathea* Liebm. in Ind. Sem. Hort. Haun. 26. 1855.

Rhizomatous *Iris*-like herbs; leaves ensiform, distichous, flabellate, basal; flowering scape terminated by a large foliaceous spathe, the short flowering peduncle appearing lateral, frequently nodding, bearing few to several rather handsome white or blue flowers; perianth tube obsolete, the 6 lobes in 2 very dissimilar series, the outer obovate, spreading, the inner much smaller, pandurate, ascending, more or less convolute; stamens short, erect, the filaments distinct; pistil club-shaped, 3-celled; style subulate at the base, cyathiform with 3 prominent angles in the upper half, style crests lanceolate with the transverse stigmas at their base; capsule oblong, 3-valved, containing numerous arillate seeds.

- a. Plants 6-8 dm. tall, the leaves and scapes with a single very definite midrib; inflorescences 2- to 5-flowered, the outer spathes 3.0-3.5 cm. long..... 1. N. GRACILIS
- aa. Plants 12-15 dm. tall, the leaves and scapes without definite midrib; inflorescences 3- to 6-flowered, the outer spathes 7-13 cm. long..... 2. N. CAERULEA



Fig. 21. *Neomarica gracilis*

1. *NEOMARICA GRACILIS* (Herb.) Sprague in Kew Bull. Misc. Inf. 1928:280. 1928.

*Marica gracilis* Herb. in Bot. Mag. pl. 3713. 1840.  
*Cypella gracilis* (Herb.) Klatt in Mart. Fl. Bras. 3<sup>1</sup>:521. 1871.

Plants 6-8 dm. tall; leaves narrowly ensiform, long-acuminate, gradually narrowed to a subpetiolar base, 4-7 dm. long, 1-2 cm. broad, with a single conspicuous midrib and numerous smaller parallel veins; flowering scape 3-5 dm. long, slightly winged below, conspicuously so above; terminal spathe leaf-like, 3-3.5 dm. long, 2-3 cm. broad, with a conspicuous midrib; flowering peduncle 1-3 cm. long, bearing 2-5 pretty white or blue flowers; perianth about 5 cm. in diameter, the spathes 1-3 cm. long; capsule oblong, about 2-3 cm. long.

Mexico to northern Brazil, in wet lowland forests and savannas.

BOCAS DEL TORO: Old Bank Island, von Wedel 2163. CANAL ZONE: Barro Colorado Island, Kew-oyer 227; Summit, Lindsay 308; Balboa, Standley 28576. COCLÉ: El Valle, Allen 756. COLÓN: Tumba Vieja, Dodge, Steyermark & Allen 16931.

2. *NEOMARICA CAERULEA* (Ker) Sprague, Kew Bull. Misc. Inf. 1928:280. 1928.

*Marica caerulea* Ker in Bot. Reg. pl. 713. 1823.

*Galathea speciosa* Liebm. in Ind. Sem. Hort. Haun. 26. 1855.

*Cypella caerulea* (Ker) Seub. ex Hook. f. in Bot. Mag. pl. 5612. 1866.

*Galathea caerulea* Liebm. ex Klatt in Mart. Fl. Bras. 3<sup>1</sup>:519. 1871, in synonym.

Plants 12-15 dm. tall; leaves narrowly ensiform, 6-9 dm. long, 3-4 cm. broad, without a definite midrib; flowering scape ensiform, 7-9 dm. long, as broad as the leaves; spathes 5-8 cm. long, terminal spathe ensiform, 5-6 dm. long; flowers 3-6, on a very short peduncle; perianth about 7-10 cm. in diameter, bright blue with brown bars at the base of the lobes.

Guiana and Brazil; widely cultivated, the Panama specimen probably an escape.

BOCAS DEL TORO: Little Bocas, von Wedel 2546.

## 2. CIPURA Aubl.

CIPURA Aubl. Hist. Pl. Guian. 1:38. pl. 13. 1775; Standl. Fl. Pan. Canal Zone, 116. 1928.

*Marica* Schreb. Gen. Pl. 1:37. 1789, non Ker.

*Bauxia* Neck. Elem. 3:160. 1790.

Small or mediocre herbs from a tunicated corm; leaves basal, distichous, narrowly ensiform; flowering scape terminated by a leaf-like spathe, the short flowering peduncle appearing lateral, bearing 2-4 rather pretty, very evanescent light blue or white flowers; perianth tube obsolete, the outer lobes obovate-cuneate, reflexed, the inner much shorter, persistently connivent; style filiform, the branches oblong, dilated and somewhat petaloid; capsule oblong-turbinate, 3-valved.



Fig. 22. *Cipura paludosa*

mark & Allen 16910; Rio Tapia, Maxon & Harvey 6627.

1. *CIPURA PALUDOSA* Aubl. Hist. Pl. Guian. 1:38. pl. 13. 1775; Standl. Fl. Pan. Canal Zone, 116. 1928.

*Cipura graminea* HBK. Nov. Gen. & Sp. 1:320. 1816.

*Cipura humilis* HBK. loc. cit. 1816.

*Marica paludosa* (Aubl.) Willd. in Bot. Mag. pl. 646. 1803.

Corm ovoid, covered with deep brown scales; leaves linear-ensiform, 1.5-5.0 dm. long, 0.4-0.6 cm. broad; flowering scapes filiform, 1.5-4.5 dm. long; terminal spathe linear-ensiform, 12-30 cm. long; inflorescence sessile, bearing 2-4 light blue or white flowers; perianth about 3-4 cm. in diameter; flowering spathes narrowly lanceolate, 2-4 cm. long.

Widespread from Mexico and Cuba to southern Brazil, in savannas and thickets chiefly at low elevations.

CANAL ZONE: Ancón Hill, Standley 26335. COCLÉ: between Aguadulce and Antón, Woodson, Allen & Seibert 1226; between Las Margaritas and El Valle, Woodson, Allen & Seibert 1268. CHIRIQUÍ: Llanos del Volcán, Seibert 348. PANAMÁ: Arraiján, Woodson, Allen & Seibert 1673; La Joya, Dodge, Hunter, Steyer-

### 3. SISYRINCHIUM L.

*SISYRINCHIUM* L. Sp. Pl. 954. 1753.

*Bermudiana* Adans. Fam. 2:60. 1763.

*Hydastylus* Dryand. ex Salisb. Trans. Hort. Soc. Lond. 1:310. 1812.

Souza Vell. Fl. Flum. 273. 1825.

*Olsynium* Raf. New Fl. N. Amer. 1:72. 1836.

*Pogadelphias* Raf. Fl. Tellur. 4:29. 1836.

*Paneguis* Raf. loc. cit. 34. 1836.

*Echthronema* Herb. in Bot. Reg. Misc. N. S. 6:83. 1843.

*Eriphilema* Herb. loc. cit. 1843.

*Glumosis* Herb. loc. cit. 1843.

*Androsolen* Lem. in Fl. Serres 2:146. 1846.

*Spathirachis* Klotzsch apud Klatt, in *Linnaea* 31:96. 1861.

*Oreolirion* Bickn. apud Wooton & Standl. in *Contr. U. S. Nat. Herb.* 19:147. 1915.

Small or mediocre herbs with fibrous or tuberous roots; leaves basal or both basal and cauline, ensiform to linear-ensiform, equitant; flowering stem leafless or leafy, simple or branched, bearing a cluster of few to several rather small pedicellate flowers partly enclosed by 2 more or less foliaceous equitant spathes; perianth with a short tube above the ovary, the segments equal or subequal, petaloid, more or less spreading above the base; stamens 3, inserted at the base of the perianth; filaments free or more or less connate; anthers versatile; ovary globose to turbinate or oblongoid, 3-celled; style subulate; stigmas 3; fruit a loculicidally 3-valved capsule.

- a. Flowering stems bearing 1 or more leaves and usually branching at least once (except in *S. chiricanum*), only slightly winged or ancipitous.
- b. Plants caespitose, forming grass-like turfs, not greatly discoloring in drying; roots slender and fibrous, the hairs extremely inconspicuous; perianth blue to pinkish lavender, usually pale yellowish at the base, about 0.7 cm. long; stamen filaments connate to the anthers; capsules globose, about 0.3 cm. in diameter; seeds about 0.1 cm. in diameter, conspicuously reticulate-foveolate. 1. *S. MICRANTHUM*
- bb. Plants not caespitose, with the habit of a miniature *Iris*, conspicuously discoloring in drying; perianth yellow veined with brown; stamen filaments connate somewhat below the middle.
- c. Stems 1-3 dm. tall; roots chiefly short and tuberous, without conspicuous persistent hairs.
- d. Stems more or less conspicuously flexuose, branching repeatedly in mature plants; fibers of past leaves somewhat persistent, but scarcely conspicuous; leaves 0.4-0.6 cm. broad, characteristically turgid and patulous, particularly upon the stem; spathe valves ovate-lanceolate; perianth 0.8-1.0 cm. long; capsules oblongoid-subglobose, scarcely longer than broad; seeds about 0.1 cm. in diameter, lustrous and conspicuously reticulate-foveolate. 2. *S. CONVOLUTUM*
- dd. Stems straight or very slightly flexuose, simple or branching infrequently; fibers of past leaves very conspicuous and matted; leaves 0.1-0.2 cm. broad, erect; spathe valves narrowly lanceolate; perianth 1.2-1.5 cm. long; capsules oblongoid, about twice longer than broad; seeds about 0.13 cm. in diameter, opaque, smooth or very inconspicuously foveolate. 3. *S. MANDONI*
- cc. Stems 4-5 dm. tall; roots elongate and only slightly fleshy, the persistent hairs very conspicuous and matted; perianth 1.6-1.8 cm. long; capsules ovoid, sharply tapered at base and tip, about 1.5 cm. long; seeds about 0.2 cm. in diameter, conspicuously reticulate-foveolate. 4. *S. CHIRICANUM*
- aa. Flowering stems leafless and unbranched, very broadly ancipitous and leaf-like, not greatly discoloring but yielding a purple dye in drying; roots elongate and fibrous; perianth about 0.8 cm. long; stamen filaments free to the ovary; capsules broadly turbinate, about 1.2 cm. long; seeds about 0.15 cm. in diameter, obscurely foveolate. 5. *S. TINCTORIUM*

1. *SISYRINCHIUM MICRANTHUM* Cav. *Diss. Bot.* 6:144. *pl.* 191, fig. 2. 1788.

*Sisyrinchium micranthemum* Pers. *Syn.* 1:50. 1805, *sphalm.*

*Marica micrantha* (Cav.) Ker. *Irid. Gen.* 22. 1827.

Small caespitose herbs usually forming grass-like turfs, not greatly discoloring in drying; roots slender and fibrous; leaves linear-ensiform, 4-9 cm. long, 0.1-0.3 cm. broad, both basal and sparse upon the flowering stems; flowering stems almost

invariably branching at least once, 7–20 cm. long, slender and only slightly ancipitous; inflorescence simple, few- to several-flowered; spathe valves very unequal, foliaceous, compressed, the outer 1–3 cm. long; perianth blue to pinkish lavender, usually yellowish at the base, rather narrow, 0.7–0.8 cm. long, minutely puberulent to glabrous at the base without; stamen filaments completely connate to the anthers, about 0.1 cm. long; capsules globose, about 0.3 cm. in diameter; seeds somewhat angular, about 0.1 cm. in diameter, conspicuously reticulate-foveolate.

Southern Mexico to Bolivia, in subalpine meadows and open woods.

CHIRIQUÍ: Volcán de Chiriquí, Woodson, Allen & Seibert 889; Cerro Punta, Seibert 250; Chiquero, Davidson 560; upper Rio Chiriquí Viejo, White & White 4; El Boquete, Pittier 2968; Bajo Chorro, Woodson & Schery 628.

*S. micranthum* is closely allied to the northern *S. angustifolium* ("Blue-eyed Grass") and the southern *S. chilense*, both of which have much more open perianths and glumaceous spathes of nearly equal valves, and which possibly are no more than subspecifically distinct upon the basis of their seeds.

2. *SISYRINCHIUM CONVOLUTUM* Nocca, Pl. Select. Hort. Ticin. sub. t. r. 1800. *Sisyrrinchium alatum* Hook. and *S. iridifolium* HBK. of many authors.

Plants with the habit of a miniature *Iris*, greatly discoloring in drying; roots partly slender and fibrous and partly short and tuberous; leaves narrowly ensiform, 7–25 cm. long, 0.4–0.6 cm. broad, characteristically turgid and patulous, both basal and cauline; flowering stems branching once or repeatedly, more or less flexuose, rather inconspicuously ancipitous, 1–3 dm. tall, surrounded at the base with rather inconspicuous fibers of past leaves; inflorescence simple, few-flowered; spathe valves about equal, ovate-lanceolate, the outer 2.0–2.5 cm. long; perianth yellow veined with brown, rather narrow, 0.8–1.0 cm. long, glabrous; stamen filaments 0.4–0.6 cm. long, connate to somewhat below the middle; capsules oblongoid-subglobose, about 1 cm. long; seeds about 0.1 cm. in diameter, lustrous and conspicuously reticulate-foveolate.

Southern Mexico to Peru, in highland llanos.

CHIRIQUÍ: Boquete, Davidson 788; Chiriquí Viejo valley, G. White 98; Llanos del Volcán, Seibert 346.

In the herbarium of the Missouri Botanical Garden are three sheets from the collection of Bernhardt, which bear his notation "*Sisyrrinchium convolutum* Nocca." While these specimens scarcely have the authenticity of actual types or isotypes, yet they represent probably plants grown by Bernhardt in his well-stocked garden at Erfurt and may rather confidently be taken as illustrative of the application of the specific name during the middle part of the past century. Bernhardt corresponded very actively with other botanists of his period and exchanged both dried specimens and seeds, such acquisitions of his now forming a little-recognized treasure of botanical antiquities in the herbarium of the Missouri Botanical Garden not duplicated elsewhere in America.

Our plants check so well with "*Sisyrrinchium convolutum*" of Bernhardt's

collection, and so adequately with published descriptions and icones that our disposition has considerable claim to accuracy. Whatever they may be, they certainly are not *S. alatum* Hook. (properly *S. Marchio* Vell.) nor *S. iridifolium* HBK., as a thoughtful examination of standard references will show. The latter species is not actually a member of the yellow-flowered *S. alatum* alliance, as it is treated usually, but of the *angustifolium-chilense* complex closely related to *S. micranthum*. Its flowers are not actually yellow, but blue-striped, at least with a yellowish base as in *S. micranthum*.

The confusion of *S. convolutum* with *S. alatum* apparently is due, at least in part, to the rather hasty efforts of Baker, who determined a widely distributed specimen from Guatemala (Heyde & Lux 3533) as the latter species, with the possible intention for his *S. alatum* var. *guatemalense* (Handb. Irid. 130. 1892), probably referable to *S. convolutum*. True *S. alatum* of South America is a very different, much larger plant with crowded, short and incurved leaves, smaller nearly globose capsules, and slender, fibrous roots.

*S. convolutum* apparently is a rather frequent species extending from Hidalgo and Jalisco, in Mexico, possibly as far south as Ecuador. We have made no effort to disentangle a full selection of synonyms for *S. convolutum*, in view of the taxonomic confusion of the genus.

3. *SISYRINCHIUM MANDONI* Baker in Jour. Bot. 14:269. 1876.



Fig. 23  
*Sisyrinchium Mandoni*

Plants with the habit of a miniature *Iris*, surrounded at the base with the matted fibers of past leaves, discoloring in drying; roots partly slender and fibrous and partly short and tuberous; leaves linear-ensiform, 9–15 cm. long, 0.1–0.2 cm. broad, erect, borne both basally and sparsely upon the stem; flowering stems 1.5–2.0 dm. tall, inconspicuously anapiculous, usually simple and straight, infrequently branching and then somewhat flexuose; inflorescence simple, 2- to 6-flowered; spathe valves subequal, lanceolate, the outer 2.5–4.0 cm. long; perianth broadly ampuliform, yellow veined with brown, 1.2–1.5 cm. long, glabrous; stamen filaments 0.4–0.6 cm. long, connate somewhat below the middle; capsules oblongoid, 1.0–1.3 cm. long, about 0.4 cm. broad; seeds subglobose, about 0.13 cm. in diameter, opaque, smooth or very inconspicuously foveolate, with a very deep micropylar pit.

Mountains of Panama, Colombia, and Bolivia.

CHIRIQUÍ: Potrero Muleto to summit, Volcán de Chiriquí, Woodson & Schery 427; valley of the upper Río Chiriquí Viejo, P. White 61; Loma Larga to summit, Volcán de Chiriquí, Woodson, Allen & Seibert 1038.

We have only Baker's description to support assignment of these plants to *S. Mandoni*, but the agreement is striking.



It is unfortunate that Baker did not include descriptions and measurements of seeds in his descriptions of *Sisyrinchia*, for we have been very strongly impressed by their use as diagnostic criteria. The smooth seeds of our Panamanian plants, with their deep micropylar pits, are quite unlike those of any other species known to us, and should be of considerable use in the final taxonomic disposition of the plants.

4. *SISYRINCHIUM chiricanum* Woodson, spec. nov.

Plantae habitu *Iridem* gracilem vel *Orthrosanthum* simulantes, fibris foliorum vetustorum basi parce persistentibus, post exsiccationem discoloratae. Radices elongatae paulo incrassatae conspicue pubescentes. Folia lineari-ensiformia, radicalia 30–40 cm. longa 0.5–1.0 cm. lata, caulinea breviora. Caulis florigeri 4–5 dm. alti inconspicue alati repetite ramosi haud flexuosi. Inflorescentia simplex 1–3-flora; spathae valvae paulo inaequales ovato-lanceolatae exteriores 2.5–4.0 cm. longae. Perianthium amplissimum luteum brunneo-nervatum 1.6–1.8 cm. longum glabrum. Stamina filamenta 0.6–0.7 cm. longa sub medio connata. Capsulae ovoideae basi aequae angustatae ca. 1.5 cm. longae 0.9 cm. crassae; semina subglobosa ca. 0.2 cm. diametralis conspicue reticulato-foveolata.

Plants with the habit of an *Iris* or an *Orthrosanthus*, surrounded at the base with persistent fibers of past leaves, greatly discolored in drying; roots elongate and somewhat fleshy, the persistent hairs very conspicuous and matted; leaves linear-ensiform, the basal 30–40 cm. long, 0.5–1.0 cm. broad, the cauline progressively shorter to the spathes; flowering stems 4–5 dm. tall, inconspicuously alate, branching repeatedly, not flexuose; inflorescence simple, 1- to 3-flowered; spathe valves slightly unequal, ovate-lanceolate, the outer 2.5–4.0 cm. long; perianth very broadly ampuliform, yellow veined with brown, 1.6–1.8 cm. long, glabrous; stamen filaments 0.6–0.7 cm. long, connate somewhat below the middle; capsules ovoid, tapered at both base and apex, about 1.5 cm. long and 0.9 cm. thick; seeds subglobose, about 0.2 cm. in diameter, conspicuously reticulate-foveolate.

Known only from the type locality.

CHIRIQUÍ: Casita Alta to Cerro Copete, Woodson & Schery 354 (TYPE, in Herb. Missouri Bot. Garden); same locality, Woodson & Schery 344 (COTYPE, in Herb. Missouri Bot. Garden).

Amongst species known to us, *S. chiricanum* most resembles *S. arizonicum*, at least as to general habit and roots. The capsules of the latter, however, are bluntly oblongoid, and its seeds are even larger than those of *S. chiricanum*. Both species are striking in their habit of bearing one or more leaves upon the branches of the flowering stems. The stems of *S. arizonicum* are more broadly winged than those of *S. chiricanum*.

5. *SISYRINCHIUM TINCTORIUM* HBK. Nov. Gen. & Sp. 1:324. 1816.

*Marica tinctoria* (HBK.) Ker, Irid. Gen. 23. 1827.

*Sisyrinchium tingens* Steud. Nomencl. 2:596. 1841.

*Sisyrinchium rigidum* Lehm. in Hamb. Gartenz. 6:415. 1850.

*Iris*-like herbs 1.5–4.0 dm. tall, not greatly discoloring, but yielding a purplish



dye in drying; roots slender and fibrous; leaves all basal, lance-ensiform, 7–25 cm. long, 0.3–1.0 cm. broad; flowering scapes simple, leafless, 15–30 cm. long, very broadly ancipitous and leaf-like; inflorescence simple, 2- to 4-flowered; spathe valves very unequal, the outer leaf-like, 3–6 cm. long; perianth 0.7–0.8 cm. long, yellow veined with brown, glabrous; stamen filaments 0.4 cm. long, free to the base; capsules broadly turbinate, 0.9–1.2 cm. long; seeds about 0.15 cm. in diameter, obscurely foveolate.

Mountains of southern Mexico to Peru and Bolivia.

CHIRIQUÍ: vicinity of Casita Alta, Volcán de Chiriquí, Woodson, Allen & Seibert 850; Finca Lerida to Peña Blanca, Woodson & Schery 322; "New Switzerland", valley of Río Chiriquí Viejo, Allen 1410; Bajo Chorro, Woodson & Schery 644; same locality, Davidson 32; valley of upper Río Chiriquí Viejo, P. White 66.

The first specimen cited, Woodson, Allen & Seiberi 850, is much smaller than the others, and may represent one of the numerous segregate species. The specimen is not in fruit, however, which we would wish to have in order to assign it to another species.



Fig. 24. *Orthrosanthus chimboracensis*

#### 4. ORTHROSANTHUS Sweet

ORTHROSANTHUS Sweet, Fl. Austral. pl. II.  
1827.

Eveltris Raf. Fl. Tellur. 4:30. 1836.

Rhizomatous herbs with the habit of an *Iris* or a gigantic *Sisyrinchium*; leaves chiefly basal, but more sparse and also reduced upward on the extensively branched flowering stem, distichous, equitant; inflorescence loosely paniculate, bearing several or many rather handsome, virtually sessile, blue flowers of moderate size; perianth tube very short, the lobes subequal, spreading; stamens inserted at the base of the perianth; filaments free or connate at the very base; anthers linear, erect; ovary clavate, 3-celled; style very short; stigma branches subulate; fruit a loculicidally 3-valved capsule.

##### 1. ORTHROSANTHUS CHIMBORACENSIS (HBK.) Sweet in Gard. Chron. 2:67. 1876.

*Moraea chimboracensis* HBK. Nov. Gen. & Sp. 1:322. 1816.

*Moraea acorifolia* HBK. loc. cit. 1816.

*Moraea gladioloides* HBK. loc. cit. 1816.

*Sisyrinchium Moritzianum* Klotzsch ex Klatt in Linnaea 31:378. 1862.

Rhizomatous herbs of moderate size, 3–10 dm. tall; leaves narrowly ensiform, chiefly basal, but also reduced and rather sparse upward on the flowering stem, 5–45 cm. long, 0.5–1.2 cm. broad; flowering stem paniculately branched and rather sparsely leafy, bearing virtually sessile clusters of few to several flowers in the axils of reduced leaves; spathes 1.0–1.5 cm. long, subequal; perianth bright blue, about 1.5–2.0 cm. long; capsules oblong-clavate, 1.0–1.5 cm. long, nearly enclosed by the spathes.

Mexico through the Andes to Peru and Bolivia, in alpine meadows.

CHIRIQUÍ: Potrero Muleto, Volcán de Chiriquí, *Davidson 1020, Woodson & Schery 423*; Cerro Copete, *Woodson & Schery 356*.

## BURMANNIACEAE

By F. P. JONKER

Annual or perennial, saprophytic or autotrophic herbs, the autotrophic species green, the saprophytic often colorless; leaves alternate, entire, simple, without stipules, mostly reduced to small scales, the non-saprophytic species often with a radical rosette of green, linear leaves; flowers hermaphrodite, usually actinomorphic, sometimes zygomorphic; stem bearing at the top 1 flower or a simple or bifid cincinnus; inflorescence sometimes pseudo-capitate; perianth corolline, limb consisting of 2 whorls of 3 lobes, one of the whorls usually smaller, seldom lacking, tube cylindrical or trigonous, sometimes 3-winged; anthers 3 or 6, (sub) sessile in the perianth throat or hanging down with short filaments; connective broad, often appendiculate; style filiform in Burmannieae, shortly cylindrical or conical in Thismieae, branching at its apex into 3 short branches each bearing a stigma, or bearing at its apex 3 sessile stigmas; ovary inferior, 1-celled with parietal placentation, or 3-celled with axile placentation; ovules numerous, anatropous, with 2 integuments; in Burmannieae perianth limb with anthers and stigmas sometimes deciduous, lower part of perianth always persistent; in other genera of this tribe whole perianth persistent; in Thismieae perianth circumscissile, only a basal, thickened ring persistent; fruit usually capsular, sometimes fleshy in Thismieae, dehiscent irregularly, or with transverse slits or at the top; seeds numerous, small, with endosperm, sometimes with loose, reticulate testa.

About 125 species, widely distributed in the tropics of both hemispheres, also in the southern United States, neighborhood of Chicago, Ill., southern Brazil and Bolivia, Mozambique, southern China, Japan, southern Australia, New Zealand and Tasmania.

- a. Anthers 3, sessile or subsessile in the perianth throat, thecae dehiscent with transverse slits; flowers actinomorphic, the perianth persistent or the tube persistent on the capsule; style as long as the perianth tube.
- b. Ovary 3-celled with axile placentation, often prominently 3-winged, but not in the Panamanian species; perianth as a whole persistent on the capsule.
- bb. Ovary 1-celled with 3 parietal placentas.
- c. Perianth limb deciduous; seeds subglobose, ovoid or ellipsoid; capsule dehiscent irregularly at the top or with irregular transverse slits; ovary with a gland at the top of both sides of the placenta.

1. BURMANNIA

2. GYMNOSIPHON

- cc. Perianth limb persistent; seeds linear or sublinear, seldom ellipsoid; capsule 3-valved, dehiscing between the placentas; ovary without glands on the placentas. 4. APTERIA
- aa. Stamens 6, hanging down in the perianth tube, thecae dehiscing longitudinally; flowers zygomorphic, the perianth circumsissile, only a small basal ring persistent on the fruit; style very short, conical. 3. THISMIA

## 1. BURMANNIA L.

BURMANNIA L. Sp. Pl. 287. 1753.

*Vogelia* J. F. Gmel. Syst. Nat. 2:107. 1791.

*Tripterella* L. C. Rich. apud Michx. Fl. Bor. Amer. 1:19. 1803.

Annual or perennial, autotrophic or saprophytic herbs, the saprophytic species often colorless; stem simple or branched, beset with scale-like leaves, in the non-saprophytic species usually with a rosette of linear leaves at the base; flowers solitary or in groups at the top of the stem or in dense terminal cymose or head-like inflorescences; perianth limb usually consisting of 6 lobes, the outer 3 being much larger, inner ones often minute, tube cylindrical-trigonus; anthers 3, subsessile in the perianth throat below the inner lobes; style filiform, branching at the top into 3 short branches, each bearing a stigma; ovary trigonous, 3-celled, placentas axile; in most species ovary and perianth tube prominently 3-winged, although not in those of Panama; ovary crowned by the persistent, dried perianth, dehiscing irregularly; seeds many, oblong or ellipsoid.

1. BURMANNIA CAPITATA (J. F. Gmel.) Mart. Nov. Gen. & Sp. 1:12. 1824; Jonker, Monogr. Burm. 69. 1938.

*Anonymos capitatus* Walt. Fl. Carol. 69. 1788.

*Vogelia capitata* J. F. Gmel. Syst. Nat. 2:107. 1791.

*Tripterella capitata* (J. F. Gmel.) Michx. Fl. Bor. Am. 1:19. 1803.



Fig. 25  
*Burmannia*  
*capitata*

Annual, erect, non-saprophytic herbs 3–30 cm. high; stem usually simple, rarely branched, bearing at the apex a capituliform inflorescence; at the base of the stem usually a few linear or linear-lanceolate, rosulate, subulate leaves up to 4 mm. long; stem leaves becoming smaller and more scale-like upwards, the uppermost appressed, about 2 mm. long; inflorescence consisting of a contracted, bifid cyme appearing like a capitulum, 2- to many-flowered; bracts lanceolate, acuminate, about 2 mm. long; flowers wingless, erect, subsessile, mostly white, yellowish or pinkish, up to 4 mm. long; perianth lobes erect, outer lobes triangular with involute margin, acute, about 0.5 mm. long, inner ones linear or narrowly oblanceolate, obtuse, almost as long as the outer, tube trigonous, about 1.5 mm. long; anthers subsessile in the upper perianth tube; connective broadly triangular, thick and fleshy, with short lateral arms bearing the thecae and two obtuse membranaceous crests at the upper surface; style thick-filiform, swollen at the base, branching at the top into 3 branches each bearing a curved, funnel-shaped stigma, the shaft about 1.5 mm. long; capsule obovoid, dehiscing transversely;

seeds small, ellipsoid to oblong, acuminate, brownish yellow, about 0.3 mm. long.

Widespread in America from North Carolina to Paraguay; Antilles.

COCLÉ: Aguadulce, *Pittier* 4945; Natá, *Allen* 823. PANAMÁ: Nuevo San Francisco, *Standley* 30774; Las Sabanas, *Standley* 40767; near Río Azote Caballo, *Dodge*, *Steyermark* & *Allen* 16856.

## 2. GYMNOSIPHON BL.

GYMNOSIPHON Bl. Enum. Pl. Jav. 1:29. 1827.

*Cymbocarpa* Miers in Proc. Linn. Soc. 1:61. 1840.

*Ptychomeria* Benth. in Hook. Jour. Bot. 7:14. 1855.

*Benitzia* Karst. in Linnaea 28:420. 1856.

Annual, erect, saprophytic herbs; stem simple or branched, 3- to many-flowered, mostly bearing a terminal, double cincinnus; leaves sessile, small, ovate or ovate-lanceolate, scale-like; flowers sessile or shortly pedicellate; perianth consisting of a tubular part and a 6-lobed limb, the outer lobes ovate, much larger than the inner; stamens 3, inserted below the inner perianth lobes; anthers sessile, the connective rather broad, exappendiculate or mucronulate, the thecae bursting with a median, horizontal slit; ovary ovoid or nearly globose; placentas 3, parietal, each bearing at both sides of the top a large, globose gland; ovules many, small, the funicles shorter than the ovules; style reaching the insertion of the stamens and branching into 3 short branches, each bearing a stigma which is often appendiculate; perianth limb deciduous below the insertion of the stamens after flowering, the upper part of the style also deciduous with the stamens; perianth tube persistent on the capsule; capsule dehiscent at the top in the Asiatic species, or irregularly in longitudinal direction with 3 clefts between the placentas in the American and African species.

- a. Flowers 8-12 mm. long; inflorescence usually 3- to 17-flowered; stem robust; anther-connective 2-lobed at the top. 1. *G. SUAVEOLENS*  
 aa. Flowers usually smaller; inflorescence 1- to 5-flowered; stem slender; anther-connective entire. 2. *G. PANAMENSIS*

1. GYMNOSIPHON SUAVEOLENS (Karst.) Urban, Symb. Ant. 3:438. 1903; Jonker, Monogr. Burm. 189. 1938.

*Benitzia suaveolens* Karst. in Linnaea 28:420. 1856.

*Ptychomeria suaveolens* (Karst.) Schltr. in Fedde Repert. Sp. Nov. 17:257. 1921.

Plants 8-30 cm. tall; stem white, robust, usually simple, bearing a terminal, bifid, 3- to 17-flowered cincinnus, sometimes single-flowered; leaves scale-like, 1-3 mm. long, ovate or lanceolate, obtuse; bracts minute; pedicels white or vinous-purple, 2-6 mm. long; flowers 8-12 mm. long; perianth white or blue, tubular part 2.0-3.5 mm. long, limb 4-5 mm. long, outer lobes ovate, obtuse, with lanceolate lateral lobes as long as or sometimes longer than the middle lobe, inner lobes clavate, sometimes rather large and equalling the middle of the outer lobes, often thick and glandular-swollen; anthers inserted in the throat of the perianth, the connective split at the top into 2 lobes bearing the thecae; style

thick-filiform, branched at the top into three branches, each bearing a stigma with 2 long, thick-filiform appendages at the top; ovary 2.0-3.5 mm. long, obovoid, bluish gray, crowned by the cylindrical persistent part of the perianth tube, about 2-4 mm. long; seeds ovoid, funicles very short.

Widespread from southern Mexico to Brazil.

CHIRIQUÍ: valley of upper Río Chiriquí Viejo, *White & White 15, 24*; vicinity of "New Switzerland", central valley of Río Chiriquí Viejo, *Allen 1402*.



Fig. 26  
*Gymnosiphon*  
*panamensis*

2. *GYMNOSIPHON PANAMENSIS* Jonker, Monogr. Burm. 109. fig. 18. 1938.

Plants 6-15 cm. tall; stem white, filiform, usually simple, sometimes shortly branched, beset with few, acute, lanceolate, scale-like leaves about 1 mm. long; inflorescence terminal, bifid and 3- to 5-flowered or solitary, branches up to 2 cm. long; bracts lanceolate, about 1 mm. long, 1-veined, acute to slightly acuminate; flowers about 8 mm. long; perianth white, the tubular part very short, about 1-2 mm. long, the limb about 4 mm. long, the outer lobes ovate to triangular, subobtusate, margin revolute, the inner lobes minute, hardly visible; anther connective broad, rounded-rhomboid, without appendages; style thick-filiform, bearing at the top 3 sessile emarginate stigmas with 2 hair-like appendages; ovary ellipsoid, truncate, up to 2 mm. long, the placenta glands bulging; capsule ellipsoid to subglobose, about 2 mm. long, crowned by the persistent, dried perianth tube.

Panama, in lowland forests.

COLÓN: top of Tumba Vieja, *Dodge, Steyermark & Allen 16928*. PANAMÁ: Río La Maestra, *Allen 18*.

3. *THISMIA* Griff.

*THISMIA* Griff. in Proc. Linn. Soc. 1:221. 1844; Jonker, Monogr. Burm. 227. 1938.

*Tribrachys* Champ. in Thwaites, Enum. Pl. Zeyl. 325. 1864.

*Rodwaya* F. Muell. in Bot. Centralbl. 45:258. 1891.

Saprophytic, fleshy herbs; underground part tuberous or (not in the Panama species) coralline or vermiform; stem usually short and unbranched, sparsely beset with small scale-like leaves; flowers erect, urceolate to campanulate, subtended by one or more scale-like bracts occasionally forming an involucre; perianth lobes 6, occasionally free and of equal length, or outer lobes smaller, sometimes the inner lobes connivent or connate, with a prominent faucal annulus; anthers usually quadrangular, 6, free or connivent into a tube, hanging with short, mostly ribbon-shaped filaments at the annulus, sometimes with alternating short, triangular lobes; ovary obconical to obovoid with 3 stalked placentas in-



served at the basal part of the ovary wall, sometimes also attached with apical stalks to the roof of the ovary; style thick and short, cylindrical or conical, persistent, bearing at its apex 3 simple or bilobate stigmas; fruit fleshy, cup-shaped, crowned by the persistent thick, fleshy, basal ring of the perianth tube and persistent style and stigmas.

1. *THISMIA PANAMENSIS* (Standl.) Jonker, Monogr. Burm. 234. 1938.

*Ophiomeris panamensis* Standl. in Jour. Wash. Acad. Sci. 7:163. 1927.

Plants 3.5–9.5 cm. tall; root system tuberous; stem erect, fleshy, leafless, 1-flowered; flower erect, without its appendages about 13 mm. long, with 4 ovate-lanceolate basal bracts up to 4 mm. long; perianth about 9 mm. long, urceolate-campanulate, very zygomorphic; inner lobes ovate, tapering at the apex to filiform appendages about 35–40 mm. long; outer lobes reflexed, ovate, rounded, without apical filiform appendages; faucal annulus prominently 3-lobed, alternating with the inner perianth lobes; anthers hanging, alternating with small triangular appendages; filaments broad, connate at their insertion with the triangular appendages into a short tube; thecae oblong, parallel; connective sagittate above the thecae, bilobed below the anthers; ovary about 2 mm. long, obovate; placentas parietal, inserted on very short stalks; style thick-filiform, conical at the base, papillose in its lower part, hairy at the apex, and there divided into 3 linear stigmas; fruit fleshy, obconical, about 3 mm. long, crowned by the persistent perianth tube and style; seeds numerous, shorter than the funicles.

Panama, in dense lowland forest.

CANAL ZONE: Barro Colorado Island, *Zetek s. n.*, Kenoyer 247; along Pearson Trail, Dodge 3484; along Shannon Trail, Dodge 3460, Woodson & Schery 988.

#### 4. *APTERIA* Nutt.

*APTERIA* Nutt. in Jour. Acad. Phila. 7<sup>1</sup>:64. *t. g.* 1834.

*Nemitis* Raf. Fl. Tellur. 4:33. 1836.

*Stemoptera* Miers in Proc. Linn. Soc. 1:62. 1840.

Small erect saprophytic annual herbs; roots short and thin; stem simple or branched, 1- or sparsely-flowered; leaves small, sessile, ovate or lanceolate, scale-like; flowers rather large, often inclined or nodding; perianth campanulate or hypocraterimorphous, lobes 6, the outer ovate, the inner narrower than the outer but of the same length, linear-lanceolate, tubular part more than 3 times the length of the lobes; stamens inserted in sacks in the perianth tube below the inner perianth lobes; filaments short, thick, the base inserted in the sacks of the perianth, bearing at the external side a large, 2-lobed wing, the lobes rounded at the apex; filaments at the top forked into the broad connective; thecae bursting transversely; ovary ovoid, slightly narrowed at the top into the filiform style, style reaching the insertion of the stamens and there dividing into three short branches, each bearing a dish-shaped stigma, often beset with germinating pollen-



grains; capsule 3-valved, dehiscing between the placentas, crowned by the wholly persistent, rolled perianth; seeds numerous, minute, oblong to ovoid or ellipsoid, sometimes slightly curved, with a loose reticulate testa.

1. *APTERIA APHYLLA* (Nutt.) Barnh. ex Small, Fl. Southeast. U. S. ed. 1, 309. 1903; Jonker, Monogr. Burmann. 205. 1938.

*Lobelia aphylla* Nutt. in Jour. Acad. Nat. Sci. Phila. 5:297. 1822.

*Apteria setacea* Nutt. loc. cit. 7<sup>1</sup>:64. 1834.

*Apteria boliviana* Rusby in Bull. N. Y. Bot. Gard. 4:447. 1907.

Plants 5–25 cm. tall; stems simple or sometimes branched, glabrous, terete, the upper part purplish, the underground part white; leaves lanceolate to ovate-



Fig. 27  
*Apteria aphylla*

lanceolate, acuminate, sessile, purplish, scale-like, about 1.5–3 mm. long and 1 mm. broad; stem 1- or sparsely-flowered, sometimes with few loose-flowered cymes at the top; flowers nodding or horizontal, 8–13 mm. long; perianth campanulate, blue, violet, or purplish, sometimes white, darker in the ovary and at the tips of the lobes, often fading to white toward the base but with darker longitudinal stripes (honey-guides), outer lobes ovate, inner lobes lanceolate to linear-lanceolate, as long as the outer lobes, obtuse, tubular part 3 times the length of the lobes; stamens inserted in crescent-shaped sacks; connective-arms broader than the filaments, wings broader than the stamens; stigmas patelliform, margin papillate, often stuck with clusters of pollen tubes; ovary obovoid, reaching a fifth of the length of the whole flowers; capsule ovoid or obovoid, sometimes nearly globose, 4–6 mm. long, crowned by the dried perianth; seeds brown, reticulate, angulate or acute at both sides, often slightly curved.

Gulf coast of United States, Mexico to Brazil and Bolivia; Cuba, Haiti, Puerto Rico.

BOCAS DEL TORO: Old Bank Island, von Wedel 2111.

## MUSACEAE

Herbs, frequently of gigantic size, with rhizomes and fibrous or tuberous roots, the stems often very short or formed by the closely imbricate bases of the sheathing petioles; leaves spiral or distichous, with sheathing petioles, without ligules; inflorescence with large foliaceous or somewhat petalaceous bracts subtending cincinnal clusters of few to numerous flowers; flowers zygomorphic, perfect or unisexual; perianth of 2 separate series of 3 more or less united segments each, both petalaceous or the outer somewhat sepalaceous; stamens 5, rarely 6, free, the outermost occasionally staminodial; anthers 2-celled, narrowly linear, longitudinally dehiscent; ovary inferior, 3-celled, each bearing 1 to many ovules; style filiform; fruit fleshy and indehiscent or capsular and loculicidally 3-valved; seeds occasionally arillate.

*Heliconia*, the only native genus of this family in Panama, is common in forests at all but the highest elevations, and is known popularly as *Platanillo*, or "Wild Banana" and "Wild Plantain" by the West Indians. One of the chief industries of the Republic is the cultivation and exportation of the Banana, *Musa sapientum* L. *M. paradisiaca* L., the Plantain, or *Plátano*, is an omnipresent fruit for cooking. *M. textilis* Née, the Manila Hemp or *Abacá*, probably is destined to become an important economic crop plant. *M. Cavendishii* Lamb. and *M. Ensete* Gmel. are encountered in cultivation. *Ravenala madagascarensis* Sonn., the Traveler's Tree, or *Arbol de Viájero*, is a curious, flat-sided ornamental occasionally planted for striking landscape effects.

The taxonomy of the Musaceae is in a very unsatisfactory state at present. Particularly is this true of *Heliconia*, the species of which have been split so finely and juggled between *Heliconia* and the illegitimate *Bibai* with such ambidexterity that a final solution will come only with the most painstaking and intimate study. In the absence of such an extensive treatment, the account which follows must be regarded as provisional.

## 1. HELICONIA L.

HELICONIA L. Mant. 2:147. 1771.

*Bibai* Mill. ex Adans. Fam. 2:67. 1763; O. Ktze. Rev. Gen. 2:684. 1891; Griggs in Bull. Torrey Club 42:315-330. 1915, *et alibi*.

*Bibaia* O. Ktze. Rev. Gen. 2:684. 1891, *nom. altern.*

*Heliconiopsis* Miq. Fl. Ind. Bat. 3:590. 1858.

Rhizomatous herbs with the habit of a Canna or a Banana, mediocre or very large; leaves distichous, frequently very large; inflorescence spiciform, with conspicuous distichous, more or less conduplicate bracts subtending the clusters of flowers, erect or pendulous; flowers perfect; perianth segments in 2 series, the inner petals more or less connate, sometimes very unequal, the outer sepals separate

and more or less adnate to the corolla; stamens 5 or 6, the sixth sometimes staminodial and petaloid; ovary inferior, 3-celled; fruit a loculicidally dehiscent capsule, somewhat fleshy and berry-like.

- a. Bracts closely imbricated for virtually their entire length at anthesis, concealing the rachis, except occasionally at the very base; plants very massive, 3-6 m. tall, resembling a Banana.
- b. Inflorescence erect or only slightly deflexed, somewhat cylindric in fruit; bracts ovate, broadest at the base, somewhat ascending or horizontally spreading, usually somewhat greenish at the keel; plants 3-4 m. tall. 1. *H. IMBRICATA*
- bb. Inflorescence pendulous, greatly compressed in fruit; bracts rhomboid, broadest distinctly above the base, somewhat deflexed at anthesis, deep red throughout; plants 4-6 m. tall. 2. *H. MARIAE*
- aa. Bracts imbricated only at their gradually decurrent bases at anthesis, thus concealing the true rachis except occasionally at the very base, ovate to ovate-lanceolate, acuminate, uniformly ascending in both flower and fruit, usually reddish with greenish or yellowish margins and keel, occasionally wholly reddish or yellowish; inflorescence erect; plants stout, 2.5-6.0 m. tall, resembling a Banana. 3. *H. BIHAI*
- aaa. Bracts relatively distant, only rarely somewhat imbricated at anthesis, the bases not decurrent nor concealing the rachis.
- b. Bracts coriaceous, broadened at the base, thus concealing the flowering and fruiting pedicels; plants relatively stout, 1.5-5.0 m. tall, resembling a Banana.
- c. Inflorescences erect; bracts spiral\*, the lowermost more or less expanded and leaf-like.
- d. Inflorescence glabrous or inconspicuously puberulent.
- e. Inflorescence shortly pedunculate, the lowermost bracts usually bearing conspicuous leafy blades; perianth about 3.5 cm. long. 4. *H. LATISPATHA*
- ee. Inflorescence long-pedunculate, the lowermost bracts usually only slightly expanded and leafy; perianth about 4.5 cm. long. 5. *H. LANKESTERI*
- dd. Inflorescence densely ferruginous-tomentose to glabrate, the lowermost bract usually bearing a conspicuous leafy blade; perianth about 5.5 cm. long. 6. *H. VILLOSA*
- cc. Inflorescences pendent.
- d. Bracts horizontally spreading or somewhat ascending at anthesis, the lowermost more or less expanded and leaf-like; inflorescence inconspicuously puberulent to glabrate. 7. *H. PLATYSTACHYS*
- dd. Bracts conspicuously deflexed at anthesis, apparently never foliaceous.
- e. Inflorescence rather inconspicuously puberulent; bracts very broadly ovate, nearly as broad as long, obtuse to broadly acute. 8. *H. ROSTRATA*
- ee. Inflorescence very conspicuously ferruginous-pubescent, the lower rachis strikingly hirsute; bracts ovate-lanceolate, less than half as broad as long, acuminate to narrowly acute. 9. *H. VELLERIGERA*
- bb. Bracts membranaceous in flower, somewhat coriaceous in fruit, somewhat narrowed at the base, thus revealing the flowering and fruiting pedicels; plants relatively slender, 1-3 m. tall, resembling a Canna.
- c. Bracts laxly spreading in flower, nearly horizontal or somewhat deflexed in fruit, the lowermost occasionally more or less expanded and foliaceous; berries broader than long; leaves relatively broad, abruptly acuminate. 10. *H. SUBULATA*
- cc. Bracts sharply ascending in flower, laxly spreading in fruit; berries about as long as broad; leaves relatively narrow, gradually acuminate. 11. *H. PSITTACORUM*

\*Difficult to observe in pressed specimens. The spiral appearance seems to be due to a secondary twisting of the rachis, the taxy of the bracts actually being distichous.



Fig. 28  
*Heliconia imbricata*

1. *HELICONIA IMBRICATA* (O. Ktze.) Baker in Ann. Bot. 7:191. 1893.

*Bibai imbricata* O. Ktze. Rev. Gen. 2:684. 1891.  
*Bibai reticulata* Griggs in Bull. Torrey Club 31:446. 1904.  
*Bibai densa* Griggs, loc. cit. 42:320. 1915.  
*Heliconia reticulata* (Griggs) Winkler in Engl. & Prantl, Nat. Pflanzenfam. 15a:536. 1930.  
*Heliconia densa* (Griggs) L. B. Smith in Contr. Gray Herb. 124:6. 1939.

Plants stout, resembling a Banana; leaves broadly oblong, 75–100 cm. long, 20–40 cm. broad, acute at the tip, rounded or somewhat cordate at the base, green, the petiole 60–70 cm. long; inflorescence erect or essentially so, the stout peduncle 3–20 cm. long, bracts usually 15–20, ovate, broadest at the base, acute, 4–5 cm. long, 5–6 cm. broad, not greatly compressed, sparsely pilosulose, somewhat ascending or horizontally spreading, dark red, usually somewhat greenish at the keel, closely imbricated virtually their entire length and concealing the rachis; perianth 2.0–2.5 cm. long; fruits subglobose, about 1 cm. thick.

Costa Rica and Panama, in lowland forest.

BOCAS DEL TORO: Isla Colón, von Wedel 400. CHIRIQUÍ: Puerto Armuelles, Woodson & Schery 862. COLÓN: Dos Bocas, Pittier; Porto Bello, Shannon; upper Río Pequeni, Fairchild & Jobbins 2460.

2. *HELICONIA MARIAE* Hook. f. in Jour. Linn. Soc. Bot. 7:69. 1864.

*Heliconia elegans* Peters. in Mart. Fl. Bras. 3<sup>2</sup>:12. 1890.  
*Heliconia Wagneriana* Peters. loc. cit. 13. 1890.  
*Heliconia conferta* Peters. loc. cit. 1890.  
*Bibaia Mariae* (Hook. f.) O. Ktze. Rev. Gen. 2:684. 1891.  
*Bibaia Wagneriana* (Peters.) O. Ktze. loc. cit. 685. 1891.  
*Bibaia conferta* (Peters.) O. Ktze. loc. cit. 1891.  
*Bibaia elegans* (Peters.) O. Ktze. loc. cit. 1891.  
*Bibai punicea* Griggs in Bull. Torrey Club 42:321. 1915.  
*Heliconia punicea* (Griggs) L. B. Smith in Contr. Gray Herb. 124:6. 1939.

Extremely robust plants resembling Banana or Manila Hemp; leaves broadly oblong, 100–120 cm. long, 20–35 cm. broad, rounded at the base, the petioles of about equal length; inflorescence pendulous, the peduncle stout, 10–20 cm. long, glabrous or pilosulose; bracts ovate-rhombic, broadest distinctly above the base, acute to obtuse, 4–12 cm. long, 4–6 cm. broad, deep red, pilosulose to glabrate, closely imbricated virtually their entire length and concealing the rachis except at the very base; perianth 2–3 cm. long, red; fruits subglobose, deep purple, about 0.5 cm. thick.

Nicaragua to Colombia, in lowland forests and thickets.

CANAL ZONE: between Gorgona and Gatún, Pittier 2290; Cerro Gordo, Standley 26000; Empire to Mandinga, Piper 5437; Matachín, Kuntze 1920. DARIÉN: Boca de Cupe, Allen 879. PANAMÁ: Tabernilla, Cowell 272.

This is the most magnificent of described *Heliconias*. Because of the aspect of the broad, flat, deep red inflorescences, it has been called "Beef-steak *Heliconia*."

3. *HELICONIA BIBAI* L. Mant. 2:211. 1771.

*Musa Bibai* L. Sp. Pl. 1043. 1753.

*Heliconia caribaea* Lam. Encycl. Meth. Bot. 1:426. 1785.

*Heliconia indica* Lam. loc. cit. 1785.

*Heliconia Biabij* Vell. Fl. Flum. 3: pl. 19. 1827.

*Heliconia buccinata* Roxb. Fl. Ind. 1:670. 1832.

*Heliconiopsis amboinensis* Miq. Fl. Ind. Bat. 3:590. 1858.

*Heliconia austro-caledonica* Vieill. in Ann. Sci. Nat. Bot. IV. 16:47. 1861.

*Heliconia Seemannii* van Houtte, Cat. 76, 183. 1875.

*Heliconia aureo-striata* Bull. Cat. 18. 1881.

*Heliconia Bourgaeana* Peters. in Mart. Fl. Bras. 3<sup>a</sup>:14. 1890.

*Heliconia Poeppigiana* Eichl. ex Peters. loc. cit. 18. 1890.

*Bibaia Bourgeauana* (Peters.) O. Ktze. Rev. Gen. 2:685. 1891.

*Heliconia Borinquena* Griggs in Bull. Torrey Club 30:658. 1903.

*Heliconia Champsneiana* Griggs, loc. cit. 657. 1903.

*Heliconia elongata* Griggs, loc. cit. 653. 1903.

*Heliconia rutila* Griggs, loc. cit. 657. 1903.

*Heliconia purpurea* Griggs, loc. cit. 656. 1903.

*Bibai Bibai* (L.) Griggs, loc. cit. 31:445. 1904.

*Bibai Borinquena* Griggs, loc. cit. 1904.

*Bibai Champsneiana* Griggs, loc. cit. 1904.

*Bibai elongata* Griggs, loc. cit. 1904.

*Bibai purpurea* Griggs, loc. cit. 1904.

*Bibai rutila* Griggs, loc. cit. 1904.

*Heliconia barqueta* Loesn. in Verh. Bot. Ver. Brandenburg 51:18. 1909.

*Bibai barqueta* (Loesn.) Griggs in Bull. Torrey Club 42:324. 1915.

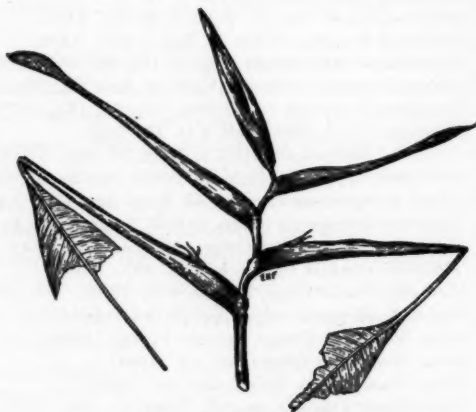
Stout plants attaining 6 m.; leaves broadly oblong, 90–120 cm. long, 20–30 cm. broad, broadly obtuse at the base; inflorescences erect, the peduncle stout, 15–50 cm. long; bracts ovate to ovate-lanceolate, long-acuminate, obtusely perfoliate at the base, thus concealing the true rachis, the tips uniformly ascending in both flower and fruit, usually reddish with greenish or yellowish margins and keel, occasionally wholly reddish or yellowish, glabrous or essentially so; perianth 4–6 cm. long, greenish; fruit oblongoid, about 1.5 cm. long.

Mexico to Peru and Brazil; Antilles; also introduced and escaped in Oceania. In lowland forests and thickets.

CANAL ZONE: Las Cascadas, Dodge & Hunter 8658; Gatún, Hayes 352; Mandinga, Piper 5438; between Gorgona and Gatún, Pittier 2291; between France Field and Catival, Standley 30347. CHIRIQUÍ: San Bartolomé, Woodson & Schery 892. COCLÉ: Penonomé, Williams 631; La Pintada, Hunter & Allen 455a; La Mesa, Allen 2708.

Extremely abundant. This is the showiest of Panamanian *Heliconias*, and the colorful spikes frequently are cut for house decoration.



Fig. 29. *Heliconia Bibai*Fig. 30. *Heliconia latispatha*4. *HELICONIA LATISPATHA* Benth. Bot. Voy. Sulphur, 170. 1844.*Heliconia meridensis* Klotzsch in Linnaea 20:462. 1847.*Bibai latispatha* (Benth.) Griggs in Bull. Torrey Club 31:445. 1904.

Stout plants 1.5–3.0 m. tall; leaves broadly oblong, 60–90 cm. long, 13–18 cm. broad, obtuse at the base, the sheath of about equal length; inflorescence erect or nearly nodding, the peduncle rather slender, 15–30 cm. long, glabrous or very inconspicuously pilosulose; bracts lanceolate, long-acuminate, broadest toward the base, the lowermost produced into more or less conspicuous leafy blades, the upper 12–18 cm. long, 2–3 cm. broad, yellow or golden-orange more or less suffused with red, glabrous; perianth about 4 cm. long, greenish yellow.

Mexico to Colombia and Venezuela, in lowland thickets and open forest.

CANAL ZONE: Summit, Standley 29997; Culebra, Pittier 4062; Ft. Sherman, Standley 31055; Gamboa, Standley 28326. COLÓN: Dos Bocas, Pittier 4207. PANAMÁ: Las Sabanas, Paul 219; Río Tecúmen, Standley 26665; Río Tapia, Standley 28266; Pedro González, Islas Perlas, Allen 2603; Vacamonte Pt., Allen 2960.

One of the most common species of the Isthmus. Widely known as *Platanillo*.

5. *HELICONIA LANKESTERI* Standl. in Jour. Wash. Acad. Sci. 17:162. 1927.

Stout herbs 1.5–2.5 m. tall, essentially glabrous throughout; leaves oblong-elliptic, 50–75 cm. long, 20–25 cm. broad, abruptly and shortly acuminate, rounded at the base; inflorescences erect, long-pedunculate (20–25 cm. long),



deltoid, 20–45 cm. long and broad, the rachis more or less flexuose at maturity, glabrous or with a few inconspicuous ferruginous trichomes, the internodes rather short; bracts almost overlapping at anthesis, narrowly oblong-lanceolate, broadly acute to obtuse, the lowermost somewhat expanded and foliaceous, 10–32 cm. long, ascending at anthesis, red or yellow; perianth about 4.5 cm. long, red or deep yellow, glabrous; fruits subglobose, about 1 cm. in diameter.

Highland forests of Costa Rica and western Panama.

CHIRIQUÍ: upper valley of Río Chiriquí Viejo, Allen 1594; Bajo Chorro, Davidson 62.

6. *HELICONIA VILLOSA* Klotzsch in Linnaea 20:463. 1847.

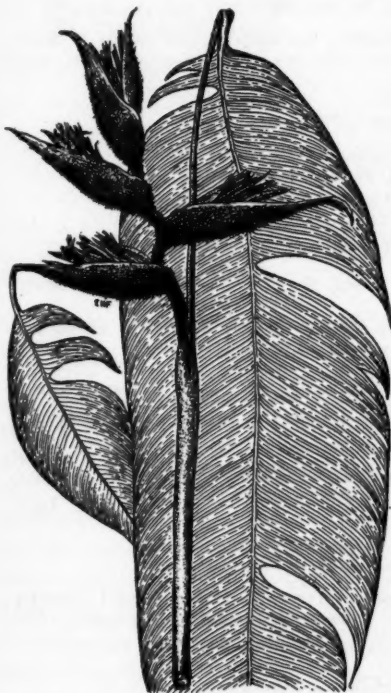


Fig. 31. *Heliconia villosa*

fruits broadly trigonal, about 1 cm. long, deep purple.

Honduras to Brazil, in highland forests.

CANAL ZONE: Río Boquerón, Hunter & Allen 659; Barro Colorado Island, Kenoyer 230; Caño Quebrado, Pittier 6827. CHIRIQUÍ: Volcán de Chiriquí, Woodson, Allen & Seibert 968; El Boquete, Pittier 2936. COCLÉ: El Valle, Allen 1818.

*Heliconia dasyantha* K. Koch & Bouché,

Ind. Sem. Hort. Berol. App. 12. 1854.

*Bibaia villosa* (Klotzsch) O. Ktze. Rev.

Gen. 2:685. 1891.

*Bibaia dasyantha* (K. Koch & Bouché) O.

Ktze. loc. cit. 1891.

*Heliconia tortuosa* Griggs in Bull. Torrey

Club 30:650. 1903.

*Bibai tortuosa* Griggs, loc. cit. 31:445.

1904.

*Heliconia nutans* Woodson in Ann. Missouri

Bot. Gard. 26:276. 1939.

Stout herbs 1.5–3.0 m. tall; leaves broadly oblong, 30–100 cm. long, 10–30 cm. broad, obtuse or rounded at the base, frequently with a deep bronze cast beneath; inflorescences erect or nodding in fruit, the peduncle slender, 15–30 cm. long, more or less ferruginous-tomentose to glabrate, the rachis tomentose to glabrate, more or less flexuose; bracts rather distant, oblong-lanceolate, broadest near the base, acuminate, the lowermost expanded into a more or less conspicuous leafy blade, the upper 7–15 cm. long, 3–6 cm. broad, deep red or orange, ferruginous-tomentose to glabrate; perianth 5.0–5.5 cm. long, greenish-yellow;

7. *HELICONIA PLATYSTACHYS* Baker in Ann. Bot. 7:194. 1893.*Bibai platystachys* (Baker) Griggs in Bull. Torrey Club 31:445. 1904.*Bibai marginata* Griggs, loc. cit. 42:323. 1915.*Heliconia marginata* (Griggs) Pittier, Man. Pl. Usual. Venez. 299. 1926.

Stout plants 2-5 m. tall; leaves broadly oblong, rounded at the base, 60-130 cm. long, 15-30 cm. broad; inflorescences pendulous, the peduncle relatively stout, 15-35 cm. long, glabrous or essentially so, the rachis strongly flexuous; bracts ovate-lanceolate, long-acuminate, 8-30 cm. long, 2-5 cm. broad, deep yellow, essentially horizontal; perianth 3-4 cm. long, greenish-yellow; fruits broadly oblongoid, about 1 cm. long.

Guatemala to Colombia and Venezuela, in lowland forest and thickets.

DARIÉN: Boca de Cupe, Allen 914. CHIRIQUÍ: San Bartolomé, Woodson & Schery 887, 891; Puerto Armuelles, Woodson & Schery 864. PANAMÁ: Vacamonte Pt., Allen 2959.

8. *HELICONIA ROSTRATA* R. & P. Fl. Peruv. 3:71. pl. 305. 1803.*Heliconia pendula* Wawra in Oesterr. Bot. Zeitschr. 13:8. 1863.*Heliconia curtispatha* Peters. in Mart. Fl. Bras. 3<sup>3</sup>:15. 1890.*Bibaia pendula* (Wawra) O. Ktze. Rev. Gen. 2:685. 1891.*Bibaia curtispatha* (Peters.) O. Ktze. loc. cit. 1891.*Bibai rostrata* (R. & P.) Griggs in Bull. Torrey Club 31:445. 1904.*Bibai longa* Griggs, loc. cit. 446. 1904.*Heliconia longa* (Griggs) Winkler in Engl. & Prantl, Nat. Pflanzenfam. 15a:536. 1930.

Stout plants 3-5 m. tall; leaves broadly oblong, 45-150 cm. long, 15-40 cm. broad, broadly obtuse at the base; inflorescences pendulous, the peduncle stout, 30-90 cm. long, rather inconspicuously puberulent, the rachis flexuous; bracts very broadly ovate, obtuse to broadly acute at the tip, broadest and somewhat cordate slightly below the middle, obtusely narrowed to the base, 4-9 cm. long, 4-8 cm. broad, minutely puberulent, deep crimson, strongly reflexed at anthesis; perianth 3-4 cm. long, greenish-yellow; fruits broadly trigonal, 1 cm. long, purplish-blue.

Nicaragua to Peru, in lowland forest and thickets.

CANAL ZONE: Gatún, Standley 27234; between France Field and Catival, Standley 30425; Ft. Sherman, Standley 31117; Frijoles, Piper 6036. DARIÉN: Marraganti, Williams 686.

9. *HELICONIA VELLERIGERA* Poeppig, Reise Chile 2:295. 1836.*Bibaia vellerigera* (Poeppig) O. Ktze. Rev. Gen. 2:685. 1891.

Stout herbs attaining 3 m.; leaves broadly oblong, somewhat cordate at the base, 75-150 cm. long, 20-50 cm. broad, usually bronze-tinged beneath; inflorescences pendulous, the peduncle stout, 15-20 cm. long, very densely clothed with long ferruginous hairs, the rachis strongly flexuous; bracts ovate-lanceolate, obtuse or somewhat cordate at the base, gradually acuminate, densely ferruginous-villous to glabrate, deep crimson, 6-15 cm. long, 3-5 cm. broad; perianth about 3 cm.

Fig. 32. *Heliconia vellerigera*

long, densely clothed with rather long golden hairs; fruits oblongoid, 1 cm. long, deep blue-purple.

Costa Rica to Peru, in highland forest.

COCLÉ: El Valle de Antón, Woodson & Schery 205, Allen 1818; Las Minas, Allen 2707. PANAMÁ: Río Boquerón, Hunter & Allen 659; Cerro Campana, Allen 2425.

Probably the most striking of all species of *Heliconia* because of the dense, golden indument of the flowers.

10. *HELICONIA SUBULATA* R. & P. Fl.

Peruv. 3:70. pl. 303b. 1802.

*Heliconia angusta* Vell. Fl. Flum. 3:pl. 20. 1827.

*Heliconia acuminata* L. C. Rich. in Nova Acta Acad. Nat. Cur. 15:Suppl. t. 11-12. 1831.

*Heliconia Choconiana* S. Wats. in Proc. Amer. Acad. 23:284. 1888.

*Bibaia acuminata* (L. C. Rich.) O. Ktze. Rev. Gen. 2:684. 1891.

*Bibai choconiana* (S. Wats.) Griggs in Bull. Torrey Club 31:445. 1904.

Plants relatively slender, resembling a Canna, 1-3 m. tall; leaves elliptic-oblong, obtuse or broadly acute at the base, 30-100 cm. long, 12-20 cm. broad; inflorescence

erect or slightly nodding in fruit, the peduncle relatively slender, 6-45 cm. long, glabrous, the rachis straight or slightly flexuose; bracts narrowly lanceolate, acuminate, 4-15 cm. long, 1-2 cm. broad, laxly spreading in flower, nearly horizontal or somewhat deflexed in fruit, glabrous or essentially so, green to yellowish or reddish; perianth 3-4 cm. long, greatly exserted, greenish, yellowish, or reddish; fruit broadly trigonal, conspicuously truncate, 0.4-0.5 cm. long, 0.5-0.7 cm. broad, deep purple.

Guatemala to Brazil and Bolivia; Antilles. In forests and thickets chiefly at lower elevations.

BOCAS DEL TORO: Changuinola Valley, Dunlap 138a; Talamanca Valley, Carleton 138; Río Cricamola, Woodson, Allen & Seibert 1431; Chiriquí Lagoon, von Wedel 1023. CANAL ZONE: Chagres, Fendler 443; Barro Colorado Island, Standley 31291; Gatún, Hayes 90; Ft. Randolph, Standley 28669; Quebrada Ancha, Dodge, Steyermark & Allen 16993. CHIRIQUÍ: San Bartolomé, Woodson & Schery 889. COCLÉ: El Valle de Antón, Allen 1669. COLÓN: Catival, Standley 30181; Colón, Kuntze 1844. DARIÉN: between Pinogana and Yaviza, Allen 259; Garagará, Pittier 5683; Cana-Cuasi Trail, Terry & Terry 1431. PANAMÁ: between Panamá and Chepo, Hunter, Dodge, Steyermark & Allen 16654; Cerro Campana, Allen 2216. SAN BLAS: Puerto Obaldía, Pittier 4404.

Fig. 33. *Heliconia subulata*Fig. 34. *Heliconia psittacorum*11. *HELICONIA PSITTACORUM* L. f. Suppl. 158. 1781.*Heliconia hirsuta* L. f. loc. cit. 158. 1781.*Heliconia marantifolia* G. Shaw, Cintel. Phys. 74. t. 38. 1796.*Heliconia cannoidea* L. C. Rich. in Nova Acta Nat. Cur. 15: Suppl. t. 9-10. 1831.*Heliconia aurantiaca* Ghiesbr. ex Lem. in Illustr. Hort. pl. 332. 1862.*Bibaia psittacorum* (L. f.) O. Ktze. Rev. Gen. 2:684. 1891.*Bibaia hirsuta* (L. f.) O. Ktze. loc. cit. 1891.*Bibaia cannoidea* (L. C. Rich.) O. Ktze. loc. cit. 685. 1891.*Heliconia hirsuta* var. *cannoidea* (L. C. Rich.) Baker in Ann. Bot. 7:197. 1893.*Bibai aurantiaca* (Ghiesbr.) Griggs in Bull. Torrey Club 31:445. 1904.*Bibai straminea* Griggs, loc. cit. 42:327. 1915.*Heliconia straminea* (Griggs) Standl. in Jour. Wash. Acad. Sci. 17:162. 1927.

Slender herbs with the habit of a *Canna*, 1-3 m. tall; leaves oblong-lanceolate, rounded at the base, rather gradually acuminate, 15-30 cm. long, 6-12 cm. broad; inflorescence erect, the peduncle slender, 3-15 cm. long, minutely puberulent to glabrate, the rachis slightly flexuous; bracts narrowly lanceolate, long-acuminate, 3-12 cm. long, 1.0-1.5 cm. broad, sharply ascending in flower, laxly spreading in fruit, membranaceous, minutely puberulent to glabrate, green to yellow or red, frequently variegated; perianth about 2 cm. long, yellow or white tipped with green, minutely puberulent to glabrate; fruits broadly oblongoid, about 1 cm. long and broad, deep blue-purple.

Mexico to Brazil and Peru; Antilles. In lowland forest and thickets, occasionally at higher elevations.

BOCAS DEL TORO: Fish Creek, *von Wedel* 2389. CANAL ZONE: Cañon of Río Chagres, *Dodge & Allen* 17343; between Corozal and Ancón, *Pittier* 6725; Gamboa, *Wheeler & Zetek s. n.*; Balboa, *Standley* 25435; Gatún, *Hayes* 90; Miraflores Lake, *P. White* 240. COCLÉ: La Mesa, *Allen* 2692. DARIÉN: Chepigana, *Terry & Terry* 1423. PANAMÁ: Río Tecúmen, *Hunter & Allen* 252; between Panamá and Chepo, *Dodge, Hunter, Steyermark & Allen* 16654; Arraiján, *Woodson, Allen & Seibert* 1355; Matías Hernández, *Pittier* 6787; Juan Díaz, *Standley* 30626; Río Tapia, *Standley* 28085; Alahuela, *Pittier* 2328. SAN BLAS: Puerto Obaldia, *Pittier* 4285.

Like all other species of *Heliconia*, *H. psittacorum* is highly variable, particularly in the pigmentation of the bracts and flowers. Segregation into varieties, if not species, may be feasible in the future.

### ZINGIBERACEAE

Perennial herbs, usually aromatic, frequently of gigantic size, with horizontal tuberous rhizomes, caulescent or scapose; leaves spiral or distichous, with an open or closed basal ligulate sheath; inflorescence 1- to many-flowered, frequently cone-like and composed of rather showy bracts subtending the solitary or clustered flowers, terminating the leafy stem or on a special radical scape; flowers perfect, relatively small to very large and showy, usually strongly asymmetrical; perianth segments 6, in two series, the outer calyx-like, the inner petalaceous, more or less strongly united; fertile stamen 1, occasionally large and petalaceous, with a 2-celled anther; staminodia 1-3, the anterior (labellum) usually largest and frequently surpassing the corolla, thus imparting the aspect of an Orchid flower; ovary inferior, 2- to 3-celled; style terminal, usually elongate, free or more or less enveloped in a groove of the fertile stamen; stigma subcapitate; fruit fleshy and indehiscent or loculicidally 3-valved; seeds mostly accompanied by a fleshy aril.

*Renealmia*, *Costus*, and *Dimerocostus* are among the most conspicuous herbs of Panamanian thickets and bush at all but the highest elevations, although favoring the coastal region. The beauty of the flowers of several species is rivalled only by certain of the native Orchids. In addition to the three native genera, *Curcuma*, *Languas* (*Alpinia*), and *Hedychium* are cultivated frequently, as well as the ubiquitous Ginger (*Zingiber*). *Hedychium coronarium*, the Ginger Lily, with its large fragrant white flowers, has established itself as a particularly exuberant escape, usually in low rather marshy spots.

- |  |                 |
|--|-----------------|
| a. Leaves distichous, the sheaths open; flowers relatively small, the stamen not petaloid. | 1. RENEALMIA    |
| aa. Leaves spiral, the sheaths closed; flowers relatively larger, the stamen petaloid.     |                 |
| b. Bracts longer than the fruit; bracteoles free, laminate; ovary 3-celled.                | 2. COSTUS       |
| bb. Bracts shorter than the fruit; bracteoles concrescent, tubular; ovary 2-celled.        | 3. DIMEROCOSTUS |



## 1. RENEALMIA L. f.

RENEALMIA L. f. Suppl. 7. 1781.

*Peperidium* Lindl. Nat. Syst. 446. 1835.

*Ethanium* O. Ktze. Rev. Gen. 2:688. 1891

Rhizomatous herbs of mediocre to gigantic size; leaves distichous, with open ligulate sheaths; inflorescence paniculate, the branches scorpioid, rarely racemose, terminating the leafy stem, or scapose and arising directly from the rhizome; calyx tubular or turbinate, regularly 3-lobed or bursting irregularly at anthesis, usually more or less coriaceous or petalaceous; corolla tubular, 3-lobed; stamen not petalaceous; labellum more or less conspicuously 3-lobed; lateral staminodia absent or very inconspicuous; ovary inferior, 3-celled; ovules numerous; fruit a fleshy, irregularly dehiscent capsule.

- a. Inflorescence terminating the leafy stem; bracts persistent in fruit, subcoriaceous..... 1. R. CERNUA
- aa. Inflorescence terminating a bracted scape arising directly from the rhizome; bracts deciduous in fruit, membranaceous.
  - b. Plants mediocre, 1-2 m. tall or less; flowers relatively small, the calyx 0.3-1.0 cm. long, persistent in fruit.
  - c. Inflorescences obviously paniculate, the bracts subtending few to several flowers.
  - d. Inflorescences thyriform, the bracts subtending an obvious secondary peduncle with few to several pedicellate flowers.
  - e. Calyx turbinate, with a spreading throat and a markedly tapered base.
  - f. Inflorescence relatively elongate and lax; leaves oblong-elliptic..... 2. R. AROMATICA
  - ff. Inflorescence relatively short and congested; leaves oblanceolate..... 3. R. MEXICANA
  - ee. Calyx urceolate, of about the same width throughout; inflorescence relatively elongate and lax; leaves oblanceolate..... 4. R. CONCINNA
  - dd. Inflorescence spiciform, the bracts subtending a fascicle of virtually sessile flowers, very congested and usually rather elongate; leaves obovate to oblanceolate; calyx turbinate..... 5. R. COSTARICENSIS
  - cc. Inflorescences racemiform, the bracts subtending solitary flowers.
    - d. Leaves grass-like, 0.8-1.7 cm. broad; flowering scapes 7-10 cm. long..... 6. R. ARUNDINARIA
    - dd. Leaves obovate-elliptic, 3.5-7 cm. broad; flowering scapes 35-40 cm. long..... 7. R. CHIRIQUINA
  - bb. Plants massive, 3-5 m. tall; flowers relatively large, the calyx 1.5-2.0 cm. long, usually circumscissile in fruit.
  - c. Flowering bracts membranaceous, oblong-lanceolate; corolla pink or red..... 8. R. EXALTATA
  - cc. Flowering bracts subcoriaceous, oblong-ovate; corolla cream..... 9. R. RUBRO-FLAVA

1. RENEALMIA CERNUA (Sw.) Macbride in Field Mus. Publ. Bot. 11:14. 1931.

*Costus cernuus* Sw. ex R. & S. Syst. 1:25. 1817.

*Renalmia strobilifera* Poeppig & Endl. Nov. Gen. & Sp. 2:26. pl. 136. 1838.

*Costus podoccephalus* Donn. Sm. in Bot. Gaz. 23:250. 1897.

Plants 1-3 m. tall; stems relatively slender; leaves oblong- to obovate-elliptic, 10-30 cm. long, 4-8 cm. broad, glabrous; inflorescence terminating the leafy



stem, sessile or subsessile, cone-like, ovoid to oblong-fusiform, 4–15 cm. long, the bracts persistent, oblong-lanceolate, acuminate to obtuse, 2–3 cm. long, orange

or deep yellow tipped with yellow or green; corolla pale yellow, 0.7–1.0 cm. long; calyx acutely 3-lobed, 0.6–0.8 cm. long, persistent, somewhat accrescent in fruit; capsules broadly ovoid, about 1 cm. long.

Guatemala to Peru, in open forests chiefly at low elevations.

BOCAS DEL TORO: Changuinola Valley, *Dunlap* 153; Isla Colón, *von Wedel* 27; Fish Creek, *von Wedel* 2320; Old Bank Island, *von Wedel* 1889; Water Valley, *von Wedel* 977. CANAL ZONE: Río Puente, *Dodge & Allen* 17475; Río Trinidad, *Seibert* 600; Gatún, *Hayes* 380; Barro Colorado Island, *Aviles* 29. CHIRIQUÍ: San Bartolomé, *Woodson & Schery* 877; Puerto Armuelles, *Woodson & Schery* 860. COCLÉ: El Valle de Antón, *Woodson & Schery* 172. PANAMÁ: Río Tecúmen, *Standley* 26731.

Very much in evidence in the lowland forest, where it is apt to be mistaken by the newcomer for a species of *Costus* because of its colorful cone-like inflorescences.



Fig. 35. *Renealmia cernua*

2. *RENEALMIA AROMATICA* (Aubl.) Griseb. Fl. Brit. W. Ind. 601. 1864.

*Alpinia aromatica* Aubl. Hist. Pl. Guian. 1:3. 1775.

*Alpinia multicaulis* Aubl. loc. cit. 1775.

*Alpinia occidentalis* Sw. Prodr. Ind. Occ. 1:9. 1788.

*Alpinia jamaicensis* Gaertn. Fruct. et Sem. 1:36. t. 12. 1788.

*Getbyra occidentalis* (Sw.) Salisb. in Trans. Hort. Soc. Lond. 1:282. 1812.

*Renealmia occidentalis* (Sw.) Sweet, Hort. Brit. 493. 1830.

Leafy stems 1–2 m. tall; leaves oblong-elliptic, 20–30 cm. long, 3.5–8.0 cm. broad, shortly petiolate to subsessile; inflorescence scapose, arising directly from the rhizome, 4.5–6.0 dm. tall, the lower  $\frac{2}{3}$  sterile and bearing several leafless sheaths 3–8 cm. long, the flowering portion rather laxly but obviously paniculate, the branches bearing few to several rather small yellow flowers, densely puberulent; bracts oblong-lanceolate, 1–3 cm. long, membranaceous, deciduous; perianth 0.4–0.6 cm. long; calyx turbinate, 0.3–0.4 cm. long, persistent and accrescent in fruit; ovary narrowly ovoid, 0.2–0.3 cm. long, minutely puberulent; capsules scarlet or deep orange, broadly oblongoid, 0.7–0.8 cm. long.



Fig. 36. *Renealmia aromatica*

British Honduras to northern Brazil; Antilles; chiefly in lowland forest.

CANAL ZONE: Ancón Hill, Killip 3049; Barro Colorado Island, Kenoyer 238. COCLÉ: El Valle de Antón, Allen 763. PANAMÁ: between Balboa and Chamé, Dodge, Hunter, Steyermark & Allen 16737; Isla Taboga, Woodson, Allen & Seibert 1463; Matías Hernández, Standley 28875.

3. *RENEALMIA MEXICANA* Klotzsch ex Peters. in Mart. Fl. Bras. 3<sup>2</sup>:45. 1890.

Leafy stems about 2 m. tall; leaves oblanceolate, abruptly acute or shortly acuminate at the tip, narrowly cuneate at the base, 25–40 cm. long, 8–12 cm. broad, distinctly petiolate; inflorescences scapose and arising directly from the rhizome, 20–30 cm. long, the lower  $\frac{2}{3}$  sterile and bearing several leafless sheaths 2–7 cm. long, the flowering portion very dense, paniculate, the branches bearing several flowers, densely puberulent; bracts oblong to oblong-obovate, 1.5–2.0 cm. long, deciduous, membranaceous; perianth 0.5–0.7 cm. long; calyx turbinate, 0.5–0.6 cm. long; ovary narrowly ovoid,

0.3–0.4 cm. long; capsules ellipsoid, about 1 cm. long.

Mexico to Panama, in lowland forest.

BOCAS DEL TORO: lower Changuinola River, Stork 131; Farm 6, vicinity of Almirante, Rowlee & Stork 1012.

These specimens may represent a phase of *R. costaricensis*, or possibly hybrids between that species and *R. aromatica*. It is odd that von Wedel did not encounter similar plants in his extensive collections about the Chiriquí Lagoon.

4. *RENEALMIA CONCINNA* Standl. in Jour. Wash. Acad. Sci. 17:249. 1927.

Leafy stems 3–6 dm. tall; leaves oblanceolate, abruptly acuminate at the tip, rather narrowly cuneate, 20–40 cm. long, 4–8 cm. broad, distinctly petiolate; inflorescence scapose and arising directly from the rhizome, 20–30 cm. long, the lower half sterile and bearing several leafless sheaths 1–3 cm. long, sparsely puberulent to glabrate, the flowering portion relatively slender and lax, subspiciform, the flowering branches short and bearing 2–4 rather small yellowish flowers; bracts obovate to ovate-lanceolate, 1.0–1.5 cm. long, membranaceous, deciduous; perianth 0.3–0.4 cm. long; calyx urceolate, about the same diameter throughout, 0.15–0.2 cm. long, green, the short lobes somewhat inflexed, accrescent in fruit; capsules broadly ellipsoid, about 0.8 cm. long.

Costa Rica and Panama, perhaps also in South America, in lowland forest and thickets.

BOCAS DEL TORO: Cricamola valley, *Cooper 196*. DARIÉN: Garagará, *Pittier 5599*.

I have a suspicion that this species may have an earlier name in the South American literature. It should be easily placed because of its distinctive calyx, but previous authors have paid little attention to this character in their descriptions.

5. *RENEALMIA COSTARICENSIS* Standl. in Field Mus. Publ. Bot. 18:190. 1937.

*Renalmia densiflora* Standl. in Jour. Wash. Acad. Sci. 17:249. 1927, non Urb.

Leafy stems 6–8 dm. tall, relatively stout; leaves obovate to broadly oblanceolate, obtuse or rounded to very abruptly acuminate, broadly cuneate at the base, 20–50 cm. long, 8–16 cm. broad, very shortly petiolate or sessile; inflorescence scapose and arising directly from the rhizome, 20–40 cm. long, the lower  $\frac{2}{3}$  sterile, bearing several leafless sheaths 1.5–4.0 cm. long, minutely puberulent, the flowering portion very dense and compact, cylindrical, the bracts broadly obovate-suborbicular, 1.5–2.5 cm. long, green, tardily deciduous; perianth pale yellow, occasionally white, the labellum lemon-yellow, 0.5–0.6 cm. long; calyx turbinate, 0.3–0.4 cm. long, orange-pink, persistent and accrescent in fruit; capsules unknown at maturity.

Costa Rica and Panama, perhaps also in South America, in lowland thickets and open forest.

BOCAS DEL TORO: Río Cricamola, *Woodson, Allen & Seibert 1882*. COLÓN: Dos Bocas, *Pittier 4213*. SAN BLAS: Puerto Obaldía, *Pittier 4327*.

These plants recall the published description of *R. spicata* Gaignp. of the Guianas, specimens of which are not available for study at present.

6. *RENEALMIA ARUNDINARIA* Woodson in Ann. Missouri Bot. Gard. 29:329. 1942.

Flowering stem 3–4 dm. tall, relatively slender, glabrous throughout; leaves very narrowly oblong-lanceolate, grass-like, attenuate at both tip and base, 7–15 cm. long, 0.8–1.7 cm. broad, rather shortly petiolate; inflorescence scapose and arising directly from the rhizome, 7–10 cm. long, the lower  $\frac{2}{3}$  sterile and bearing several leafless sheaths about 1 cm. long, the flowering portion racemiform, relatively compact and dense, the bracts oblong-lanceolate, about 0.5 cm. long, subtending (apparently) each a solitary flower; perianth unknown; fruiting calyx narrowly turbinate, scarlet, 0.5 cm. long; capsules ellipsoid, 0.6–0.7 cm. long, scarlet.

Eastern Panama, probably also in Colombia, in lowland forest.

DARIÉN: Garagará, *Pittier 5597*.

7. *RENEALMIA CHIRIQUINA* Standl. in Field Mus. Publ. Bot. 22:7. 1940.

Flowering stems 4–8 dm. tall; leaves obovate-elliptic, 8–18 cm. long, 3.5–7.0 cm. broad; inflorescence scapose, arising directly from the rhizome, 35–40 cm. long, the sterile portion bearing rather distant leafless sheaths 2–5 cm. long, the flowering portion subcapitate, about 3 cm. long, bracts obovate-oblong, 1.0–1.5 cm. long, subtending solitary, light yellow or white flowers; perianth about 1 cm. long; calyx turbinate, 0.8–0.9 cm. long; capsule unknown.

Panama, in highland forest.

CHIRIQUÍ: Bajo Chorro, Davidson 386; Cerro Horqueta, C. & W. von Hagen 210.

A very peculiar plant of uncertain affinity.

8. *RENEALMIA EXALTATA* L. f. Suppl. 79. 1781.

*Alpinia exaltata* (L. f.) G. F. W. Meyer, Prim. Fl. Esseq. 4. 1818.

*Alpinia Renealmia* J. E. Sm. in Rees, Cycl. 39. no. 14. 1818.

*Alpinia tubulata* Lindl. in Bot. Reg. pl. 777. 1824.

Leafy stems very massive, 3–5 m. tall; leaves broadly lanceolate or obovate, 3–10 dm. long, 6–20 cm. broad, shortly petiolate or sessile; inflorescence scapose, arising directly from the rhizome, 20–45 cm. long, the lower half sterile, bearing several large leafless sheaths 2–8 cm. long, the flowering portion paniculate, the branches bearing 2–3, rarely solitary, scarlet flowers of relatively large size; perianth 1.5–2.5 cm. long; calyx turbinate, 1.5–2.0 cm. long, scarlet, coriaceous, usually abscising in fruit; capsules broadly ellipsoid, about 2 cm. long, deep purple.

Mexico to Brazil; Antilles. Chiefly in lowland forest and thickets.

BOCAS DEL TORO: Río Cricamola, Woodson, Allen & Seibert 1905; Almirante, Skutch 8; Water Valley, von Wedel 983; Western River, von Wedel 2785. COCLÉ: El Valle de Antón, Allen 2151. DARIÉN: Río Yape, Allen 364. CHIRIQUÍ: Bajo Mona and Quebrada Chiquero, Woodson & Schery 601.

9. *RENEALMIA RUBRO-FLAVA* K. Sch. in Engl. Pflanzenreich IV. 46:297. 1904.

Gigantic herb, the leafy stem attaining 5 m. in height; leaves broadly oblong-elliptic, shortly acuminate, broadly cuneate at the base, 6–8 dm. long, 20–25 cm. broad, sessile or subsessile; inflorescence scapose, arising directly from the rhizome, 25–30 cm. long (immature), the lower half sterile and densely covered with leafless sheaths 4–8 cm. long, the flowering portion paniculate, minutely puberulent, the branches bearing 2–4 rather mediocre cream-colored flowers; bracts subcoriaceous, broadly oblong, 3–7 cm. long; perianth about 2 cm. long; calyx turbinate, about 2 cm. long, persistent or circumscissile in fruit; capsule unknown.

Panama to Ecuador.

COCLÉ: El Valle de Antón, Allen 1654.

Perhaps only a variety of *R. exaltata*.

2. *COSTUS* L.*Costus* L. Sp. Pl. 2. 1753.*Banksea* Koenig, in Retz. Observ. 3:75. 1783.*Pyxa* Noronha, Verh. Bat. Genootsch. 5<sup>4</sup>:3. 1791.*Hellenia* Retz. Observ. 6:18. 1791.*Tsiana* Gmel. Syst. 9. 1791.*Planera* Giske. Prael. 205. 1792.*Glissanthe* Salisb. Trans. Hort. Soc. Lond. 1:279. 1812.*Jacuanaga* Lestiboud. Ann. Sci. Nat. Bot. II. 15:329, 341. 1841.*Cadalvena* Fenzl. Sitzungsber. Akad. Wien 51:139. 1863.

Rhizomatous perennial herbs of moderate to massive stature with unbranched stems (in Panama); leaves spiral, with closed, ligulate sheaths; inflorescence terminating the leafy stem (in Panama, elsewhere occasionally on special scapes directly from the rhizome), spiciform, cone-like, with conspicuous persistent imbricated bracts subtending one or few showy or rather inconspicuous flowers; calyx more or less equally 3-lobed, persistent; corolla somewhat unequally 3-lobed; stamen 1, conspicuously petalaceous; labellum (anterior staminodium) at least equalling and frequently far surpassing the corolla; ovary inferior, 3-celled, containing numerous ovules; fruit a tardily dehiscent, somewhat fleshy capsule.

- a. All bracts with conspicuous foliaceous apical appendages.
  - b. Bracts green or reddish within at the base; flowers 8-13 cm. long, the labellum very conspicuous, greatly surpassing the corolla and stamen.
    - c. Plants very conspicuously ferruginous-hirsute; stems somewhat spiral, relatively slender; bracts lax and membranaceous, usually green within at anthesis; corolla pale yellow to nearly white; labellum yellow, usually without markings, widely spreading. 1. *C. VILLOSISSIMUS*
    - cc. Plants softly puberulent or pilosulose to essentially glabrous; stems straight and relatively stout; bracts turgid and subcoriaceous, usually reddish within at anthesis; corolla pale pinkish yellow to nearly white; labellum pinkish yellow with darker orange or yellow markings, sharply reflexed. 2. *C. FRIEDRICHSII*
  - bb. Bracts deep red or pink throughout; flowers 3-5 cm. long, the labellum rather inconspicuous, about as long as the corolla and stamens; plants softly ferruginous-puberulent to nearly glabrous. 3. *C. LIMA*
- aa. Bracts without foliose apical appendages, or only the lowermost somewhat leaf-like.
  - b. Flowers 7-10 cm. long, the labellum very conspicuous and spreading, reddish or purplish orange with showy pale yellow veins; plants massive; the stems stout and usually quite straight, the leaves narrowly elliptic to oblanceolate, the upper 30-40 cm. long. 4. *C. LAEVIS*
  - bb. Flowers 3-5 cm. long, the labellum essentially similar to the petals or somewhat less conspicuous, not venose; plants smaller, the stems relatively slender and usually somewhat spiral, the upper leaves 8-20 (rarely 30) cm. long.
    - c. Bracts with the margins densely ciliate, otherwise minutely puberulent to glabrous, usually bright red with a conspicuous yellow callus, rarely orange or greenish; flowers red or reddish orange; leaves obovate or oblanceolate, gradually narrowed toward the base. 5. *C. RUBER*
    - cc. Bracts puberulent to glabrous, but the margins not ciliate.
      - d. Bracts and flowers red; leaves broadly obovate-oval, rather obscurely subcordate-auriculate at the base; plants wholly glabrous. 6. *C. SPIRALIS*



- dd. Bracts and flowers yellow or orange, very rarely red; leaves obtuse or rounded at the base.
- e. Bracts broadly obtuse or rounded throughout, with a more or less conspicuous linear callus; spikes relatively compact.
- f. Leaves obovate to oblanceolate, broadest distinctly above the middle, densely ciliate on the margins, otherwise glabrous, the sheaths minutely puberulent to glabrous; spikes usually 4-5 cm. thick, cylindric or subcylindric and much longer than broad.
- ff. Leaves elliptic, broadest at about the middle, generally puberulent beneath, particularly the midrib, rarely glabrate, the margins not ciliate, the sheaths rather sparsely spreading-villous, infrequently glabrate; spikes usually 1.5-2.5 cm. thick, broadly ovoid.
- gg. Bracts rather narrowly acute, without a callus; spikes relatively loose, broadly ovoid, 4.5-5.0 cm. thick; leaves oblong-oblanceolate, broadest toward the tip, generally puberulent beneath, particularly the midrib, the sheaths puberulent or pilosulose.
7. *C. SPICATUS\**
8. *C. NUTANS*
9. *C. SCABER\**

\**C. spicatus* and *C. scaber* apparently hybridize with *C. nutans*.

1. *COSTUS VILLOSISSIMUS* Jacq. *Fragm. Bot.* 55. *pl. 80.* 1800-09.

*Costus hirsutus* Presl, *Reliq. Haenk.* 1:112. 1830.

*Costus spicatus* (Jacq.) Sw. var. *β. pubescens* Griseb. *Fl. Brit. W. Ind.* 602. 1864.

Plants rather stout, 2-3 m. tall, the stem somewhat spiral; leaves closely sheathing, obovate to broadly oblanceolate, apex abruptly acuminate, base broadly cuneate and very obscurely auriculate-subcordate, sessile or subsessile, the upper 15-30 cm. long, 5-13 cm. broad, very conspicuously ferruginous-pilose, particularly the sheaths, margins and midrib; inflorescence broadly ovoid, sessile and set amongst the upper somewhat reduced leaves, 5-10 cm. long; bracts all with spreading foliaceous tips, 5-8 cm. long, ferruginous-pilose, usually green within and without; calyx about 1 cm. long, broadly 3-dentate; ovary 0.5 cm. long; corolla pale yellow to nearly white, about 7 cm. long, the lobes oblong-elliptic; stamen 5-6 cm. long, oblong; labellum exceedingly showy, broadly 3-lobed, 9-10 cm. long, widely spreading, pale yellow, without markings (except in suspected hybrids with *C. Friedrichsenii*).

Guatemala to British Guiana and Peru, chiefly in lowland thickets and light forest.

CHIRIQUI: Remedios, Woodson, Allen & Seibert 788. COCLÉ: El Valle de Antón, Allen 2185. COLÓN: Catival, Standley 30394. CANAL ZONE: Ancón Hill, Seibert 121; Gold Creek, Seibert 593; Balboa, Standley 29324; Miraflores Lake, G. White 186. PANAMA: Campana, Woodson, Allen & Seibert 1678; Arraiján, Woodson, Allen & Seibert 785; Taboga Island, Standley 27892; Trapiche, Perlas Island, Allen 2619.

The delicately yellow orchidaceous flowers of this species lighten many a dingy lowland thicket in Panama. It apparently hybridizes with the equally frequent and even showier *C. Friedrichsenii*. In Panama, *C. villosissimus* is popularly known as *Cañagria* and *Caña de Mico*, and is said to be a remedy for venereal diseases.



Fig. 37. *Costus villosissimus*

2. *COSTUS FRIEDRICHSENII* Peters. in Bot. Tidsskr. 18:260. 1893; Woodson in Ann. Missouri Bot. Gard. 29:329. 1942.

Plants stout, 2-4 m. tall, the stem stout and straight; leaves closely sheathing, broadly obovate-elliptic, rather shortly acuminate, rather broadly cuneate toward the base, 20-50 cm. long, 8-14 cm. broad, softly and densely puberulent beneath, somewhat scabrid above, the sheaths minutely and rather sparsely puberulent to glabrate; inflorescence broadly ovoid, sessile and set amongst the upper leaves, 12-15 cm. long; bracts all with rather turgid and recurved foliaceous tips, 5-9

Fig. 38. *Costus Friedrichsenii*

cm. long, very minutely puberulent to essentially glabrous, green but usually flushed with red within at anthesis; calyx about 1.3 cm. long, broadly 3-dentate; ovary about 0.7 cm. long; corolla pale pinkish yellow to nearly white, 7-8 cm. long, the lobes obovate-oblong; stamen 5-6 cm. long; labellum exceedingly showy, broadly 3- to 5-lobed, 10-11 cm. long, pinkish yellow with darker orange or reddish markings, sharply reflexed.

Guatemala to Bolivia, chiefly in lowland thickets and forest.

BOCAS DEL TORO: Little Bocas, von Wedel 2520. CANAL ZONE: Barro Colorado Island, Standley 41068; Ft. Randolph, Maxon & Harvey 6510. CHIRIQUÍ: Remedios, Woodson, Allen & Seibert 789. PANAMÁ: Arraiján, Woodson, Allen & Seibert 1358; Juan Díaz, Stevens 1224.

This is the most magnificent species of *Costus* in Panama. It has been confused until recently with *C. villosissimus*, although the two may be distinguished easily in or out of flower from quite a respectable distance.

3. *COSTUS LIMA* K. Sch. in Engl. Pflanzenreich IV. 46:388. 1904.

*Costus lima* K. Sch. var. *Wedelianus* Woodson in Ann. Missouri Bot. Gard. 26:277. 1939.

Plants stout, 2-4 m. tall, the stem somewhat spiral; leaves closely sheathing, oblong-elliptic, narrowly acuminate, broadly cuneate at the base, sessile or subsessile, 18-40 cm. long, 5-12 cm. broad, densely ferruginous-sericeous beneath, minutely scabrid above, the sheaths rather irregularly ferruginous-pilosulose; inflorescence broadly ovoid to rather narrowly cylindrical-fusiform, sessile and closely set amongst the upper somewhat reduced leaves; bracts deep red or pink throughout, with conspicuous acute reflexed apical appendages, ovate-lanceolate, 3-7 cm. long, minutely scabridulous; calyx about 0.8 cm. long, broadly 3-dentate; ovary 0.4 cm. long; corolla 3.0-5.0 cm. long, deep pink, the lobes obovate-oblong; labellum obovate-oblong, about equalling the corolla, pink; stamen 3 cm. long.

Costa Rica and Panama, possibly northward to Guatemala, in low thickets and open forest, particularly along swamps or rivers.

BOCAS DEL TORO: Nievecita, Woodson, Allen & Seibert 1835; Río Cricamola, Woodson, Allen & Seibert 1926; Isla Colón, von Wedel 28; Water Valley, von Wedel 1632. CHIRIQUI: Remedios, Woodson, Allen & Seibert 786. COCLÉ: Penonomé, Williams 431.

Very conspicuous because of the inflorescences like bloody pikes. *C. Bakeri* K. Sch., of Guatemala, possibly is synonymous.

4. *COSTUS LAEVIS* R. & P. Fl. Peruv. 1:3. 1798; Woodson in Ann. Missouri Bot. Gard. 29:330. 1942.

*Costus laxus* Peters. in Mart. Fl. Bras. 3<sup>2</sup>:56. 1890.

*Costus giganteus* O. Ktze. Rev. Gen. 2:687. 1891, non Ridl.

*Costus splendens* Donn. Sm. & Tuerckh. in Bot. Gaz. 33:260. 1902.

*Costus maximus* K. Sch. in Engl. Pflanzenreich IV. 46:405. 1904.

*Costus Weberbaueri* Loesn. in Notizblatt. K. Bot. Gart. 10:712. 1929.

*Costus Malortieanus* Wendl. var. *amazonicus* Loesn. loc. cit. 710. 1929.

*Costus amazonicus* (Loesn.) Macbr. in Field Mus. Publ. Bot. 11:13. 1931.

*Costus Skutchii* Morton in Jour. Wash. Acad. Sci. 27:306. 1937.

Plants usually quite stout, 1-4 m. tall, essentially glabrous throughout, or the bracts and leaves indefinitely papillate; stems straight or somewhat spiral; leaves narrowly elliptic to oblanceolate, acuminate, broadly cuneate and obscurely subauriculate at the base, shortly subpetiolate, 15-40 cm. long, 4-12 cm. broad; inflorescence broadly ovoid to oblong-fusiform, sessile and set closely amongst the upper reduced leaves, 5-25 cm. long; bracts without appendages or only the lowermost somewhat leaf-like, broadly ovate, obtuse, 2.5-3.5 cm. broad, deep yellowish green flushed with crimson within at anthesis, usually with a conspicuous yellow linear callus; calyx 1 cm. long, broadly 3-dentate; ovary 0.4 cm.



Fig. 39. *Costus laevis*

long; corolla 4.0–6.5 cm. long, yellowish white, the lobes obovate-oblong; labellum 7–8 cm. long, broadly 3-lobed and sharply reflexed, reddish orange with pale yellow reticulations.

Guatemala to Peru and northern Brazil, chiefly in lowland thickets and open forest.

BOCAS DEL TORO: Río Cricamola, Woodson, Allen & Seibert 1929; Water Valley, von Wedel 1507; Little Bocas, von Wedel 2506; Fish Creek, von Wedel 2219a. CANAL ZONE: Ft. Randolph, Standley 28672; Chagres, Fendler 447; Quebrada Ancha, Steyermark & Allen 17112. COCLÉ: El Valle de Antón, Allen 2199.

A magnificent species outstanding in the genus because of the showy flowers with reticulated labellum.

5. *COSTUS RUBER* Griseb. Cat. Pl. Cub. 256. 1866; Woodson in Ann. Missouri Bot. Gard. 29:330. 1942.

*Costus formosus* Morton in Jour. Wash. Acad. Sci. 27:305. 1937.

*Costus spicatus* of authors, not Jacq.

*Costus spiralis* of authors, not Rosc.

Plants 0.5–3.0 m. tall, the stem strongly spiral; leaves obovate to oblanceolate, very abruptly acuminate, broadly cuneate at the base, 8–30 cm. long, 4–10 cm. broad, glabrous or essentially so, sessile or subsessile; inflorescence ellipsoid to narrowly fusiform, set rather closely amongst the upper reduced leaves, 3–16 cm. long, usually sharply pointed at the tip; bracts broadly ovate, acute, unappendaged, 2.0–3.5 cm. long, usually bright red with a conspicuous yellow callus, rarely orange or greenish, densely ciliate with short more or less arachnoid hairs, otherwise minutely puberulent-papillate to glabrous; calyx about 0.7 cm. long, broadly 3-dentate, deep pink; ovary 0.3 cm. long; corolla 3–4 cm. long, scarlet to pinkish orange, the lobes obovate-oblong; labellum 4–5 cm. long, obovate-oblong, scarlet to reddish orange; stamen 5–6 cm. long, rather narrowly oblong.

Guatemala to Colombia; Antilles. Chiefly in lowland thickets and open forests.

BOCAS DEL TORO: Pumpkin River, von Wedel 2586. CANAL ZONE: Gold Creek, Seibert 584; Mojinga Swamp, Allen 866; Barro Colorado Island, Woodson & Schery 966; Río Pequeni, Woodson, Allen & Seibert 1597; Quebrada Ancha, Steyermark & Allen 17112. CHIRIQUI: Puerto Armuelles, Woodson & Schery 857; San Felix, Allen 1956; San Bartolomé, Woodson & Schery 886. COCLÉ: El Valle de Antón, Seibert 419, Allen 1825. DARIÉN: Pinogana, Allen 938.

This is probably the most attractive of the smaller species of *Costus*. *C. sanguineus* Donn. Sm. of Guatemala possibly is synonymous.

6. *COSTUS SPIRALIS* (Jacq.) Rosc. Monandr. Pl. pl. [79]. 1828; Woodson in Ann. Missouri Bot. Gard. 29:331. 1942.

*Alpinia spiralis* Jacq. Hort. Schoenbr. 1:1. tab. 1. 1797.

*Costus Pisonis* Lindl. in Bot. Reg. pl. 899. 1825.



Fig. 40. *Costus ruber*

Plants 1–2 m. tall, essentially glabrous throughout, the stem somewhat spiral; leaves broadly obovate-oval, abruptly subcaudate-acuminate, base rather obscurely subcordate-auriculate, 12–25 cm. long, 4–8 cm. broad, very shortly petiolate; inflorescence closely set amongst the upper reduced leaves, very broadly ovoid, 2–5 cm. long; bracts unappendaged, broadly ovate, 1.5–2.0 cm. long, deep red, gla-



brous; calyx 0.5–0.6 cm. long, broadly 3-dentate, red; ovary 0.4 cm. long; corolla 2.0–2.5 cm. long, deep red, the stamen and labellum about equal.

Antilles; Panama, probably also in Costa Rica and northern Colombia. in lowland thickets.

BOCAS DEL TORO: Isla Colón, von Wedel 2939; Old Bank Island, von Wedel 2000; Bastimentos Island, von Wedel 2899.

This species appears to be limited to the islands of the Chiriquí Lagoon. The specimens coincide strikingly with Jacquin's illustrations of *C. spiralis*, and particularly with those of Roscoe.

7. *COSTUS SPICATUS* (Jacq.) Sw. Prodr. Ind. Occ. 11. 1788.

*Alpinia spicata* Jacq. Select. Stirp. Amer. Hist. pl. 1. 1763.

*Costus conicus* Stokes, Mat. Med. 1:75. 1812.

Plants relatively slender, 1–3 m. tall, the stems somewhat spiral; leaves obovate to oblanceolate, narrowly and usually rather abruptly acuminate, base cuneate, 9–30 cm. long, 3–12 cm. broad, glaucous, the margins ferruginous-ciliate, otherwise glabrous, very shortly petiolate; inflorescence sessile, set amongst the upper reduced leaves, broadly ovoid to cylindrical, 5–14 cm. long; bracts unappendaged or the lowermost somewhat leaf-like, broadly ovate, obtuse, 2–3 cm. long, orange with a yellowish linear callus, glabrous or indefinitely papillate; calyx 0.5 cm. long, broadly 3-dentate, pale yellow flushed with pink at the tips; ovary 0.4 cm. long; corolla 2–3 cm. long, orange-yellow, the lobes obovate-oblong; labellum 3.0–3.5 cm. long, yellow; stamen about equalling the labellum.

Antilles; Costa Rica to Caribbean Colombia, chiefly in lowland thickets and open forest.

BOCAS DEL TORO: Nievecita, Woodson, Allen & Seibert 1951. CHIRIQUÍ: San Bartolomé, Woodson & Schery 922; Quebrada Velo, Woodson & Schery 282.

Great uncertainty has attended the application of *C. spicatus*, *C. cylindricus*, and *C. spiralis*. The plants cited above coincide well with authoritative icones, but, because of the current confusion of names, it is difficult to assign the exact range of the species. *C. spicatus* apparently hybridizes with *C. nutans* in the Pacific foothills (Woodson & Schery 282).

8. *COSTUS NUTANS* K. Sch. in Engl. Pflanzenreich IV. 46:407. 1904.

Slender plants about 1 m. tall; stems strongly spiral; leaves elliptic, narrowly acuminate or subcaudate-acuminate, base broadly acute, 7–14 cm. long, 2–6 cm. broad, very shortly petiolate, rather inconspicuously ferruginous-pilose beneath, glabrous above or the midrib ferruginous-pilosulose; sheaths ferruginous-pilose, particularly above; inflorescence ovoid, rather sharp-pointed, set closely amongst

the upper leaves, 3–5 cm. long; bracts broadly ovate, obtuse, unappendaged, 1.5–2.0 cm. long, bright yellow to orange, rarely scarlet, with a rather inconspicuous yellow callus; calyx 0.3 cm. long, broadly 3-dentate; ovary 0.3 cm. long; corolla about 2 cm. long, yellow, about equalling the labellum and stamen.

Costa Rica and Panama, probably also in northwestern Colombia, in mountain and foothill forests and thickets.

CHIRIQUÍ: Boquete, Woodson, Allen & Seibert 1169; San Felix, Allen 1952. COCLÉ: El Valle de Antón, Seibert 454, Allen 1789; Cerro Valle Chiquito, Seibert 508; Las Margaritas, Woodson, Allen & Seibert 1231. DARIÉN: Mt. Pirri, Goldman 1963.

*C. nutans* apparently hybridizes with *C. scaber*, and the following plants probably should be construed as evidence: CHIRIQUÍ: Bajo Mona, Woodson, Allen & Seibert 1000; Boquete, Davidson 726; Río Gariché, Seibert 330. Although these specimens should key to *C. nutans*, their relationship to *scaber* is indicated by their larger stature, their more massive inflorescences, and their lack, or virtual lack, of the ferruginous pilosity of *C. nutans*.

9. *COSTUS SCABER* R. & P. Fl. Peruv. 1:2. pl. 3. 1798; Woodson in Ann. Missouri Bot. Gard. 29:330. 1942.

Rather stout plants 1–2 m. tall, the stem somewhat spiral, usually disproportionately thick; leaves oblong-ob lanceolate, rather abruptly acuminate, broadly cuneate toward the base, very shortly petiolate, 15–30 cm. long, 5–8 cm. broad, generally puberulent beneath, particularly the midrib, essentially glabrous above; inflorescence broadly ovoid, set amongst the reduced upper leaves, 3–8 cm. long; bracts ovate, rather narrowly acute, 2.5–4.0 cm. long, orange to scarlet, without a callus, essentially glabrous; calyx about 1 cm. long, broadly 3-dentate, red; ovary 0.4 cm. long; corolla about 3 cm. long, the labellum and stamen about equalling, bright yellow.

Panama to Peru, probably also in Costa Rica, in mountain and foothill thickets and open forest.

CHIRIQUÍ: Bajo Mona, Woodson & Schery 544. COCLÉ: El Valle de Antón, Woodson & Schery 202. PANAMÁ: Campana, Allen 1873.

### 3. DIMEROCOSTUS O. Ktze.

DIMEROCOSTUS O. Ktze. Rev. Gen. 2:687. 1891.

Gigantic rhizomatous unbranched herbs; leaves spiral, with closed ligulate sheaths, congested near the tip of the elongate stem; inflorescence spiciform, scarcely cone-like as in *Costus*, the bracts much shorter than the subtended clusters of flowers, the bracteoles concrescent and tubular, closely investing the ovaries; calyx tubular, 3-parted above; corolla 3-lobed; labellum extremely showy; stamen 1, petaloid; ovary inferior, 2-celled; fruit a tardily dehiscent capsule.

1. *DIMEROCOSTUS UNIFLORUS* (Poeppig) K. Sch. in Engl. Pflanzenreich IV. 46:427. 1904.

*Costus uniflorus* Poeppig. ex Peters. in Mart. Fl. Bras. 3<sup>3</sup>:58. 1890.  
*Dimerocostus strobilaceus* O. Ktze. Rev. Gen. 2:687. 1891.



Fig. 41. *Dimerocostus uniflorus*

Plants very stout, 3-6 m. tall; stem somewhat spiral; leaves congested toward the top of the stem, oblong-ob lanceolate, narrowly acuminate, gradually narrowed to the base, sessile, 20-45 cm. long, 5-7 cm. broad, minutely sericeous to essentially glabrous beneath; inflorescence cylindrical, somewhat spirally contorted, 15-30 cm. long, 5-6 cm. broad, bearing numerous closely sheathing green closed bracts 2-3 cm. long, each usually with a linear callus; calyx 2-3 cm. long, coriaceous, ovary subcylindrical, 2 cm. long, both minutely sericeous; corolla white, or yellowish within, 7-8 cm. long, the lobes narrowly oblong; labellum extremely showy, broadly 2-lobed, 9-11 cm. long and broad, white; stamen 3-4 cm. long.

Costa Rica to Peru, in lowland thickets and open forests.

Bocas del Toro: Isla Colón, von Wedel 25; Water Valley, von Wedel 2664. CANAL ZONE: Río Pequeni, Allen 17274; Las Cruces, Seibert 582; Barro Colorado Island, Dodge 3461; Ft. San Lorenzo, Maxon & Valentine 6990; Colón, Kuntze 1873. DARIÉN: Maraganti, Williams 689. PANAMÁ: Hacienda La Joya, Dodge, Hunter, Steyermark & Allen 16915; Río Tapia, Standley 28127.

The elongate unbranched stems of *D. uniflorus*, with their crowns of elongate leaves and their magnificent white flowers which open only one at a time upon any plant, create a most striking and familiar sight in lowland Panama.

## CANNACEAE

## 1. CANNA L.

CANNA L. Sp. Pl. 1. 1753.

*Katubala* Adans. Fam. 2:67. 1763.

*Cannacorus* Tourn. ex Medic. in Acta Acad. Theod.-palat. 6: Phys. 378. 1790.

*Xyphostylis* Raf. Fl. Tellur. 4:52. 1836.

*Distemon* Bouché in Linnaea 18:494. 1844.

*Eurystylis* Bouché, loc. cit. 485. 1844.

Mediocre to fairly massive, leafy, rhizomatous herbs; leaves spiral, relatively large, with an eligulate sheath; inflorescence racemiform or paniculate, bracteate, the bracts usually subtending a cincinnus of 2 more or less showy, usually brightly colored perfect flowers; sepals 3, free, more or less foliaceous or petalaceous, essentially equal; petals 3, nearly equal, more or less connate at the base; fertile stamen 1, petaloid, bearing a solitary marginal anther, more or less connate at the base with the somewhat petaloid style, a petaloid anterior (labellum) and 2-3 showy posterior staminodia; ovary inferior, 3-celled, conspicuously warty or spiny-fimbriate, containing numerous ovules; fruit a rather large warty or spiny-fimbriate capsule finally opening by the collapse of the pericarp; seeds round and very hard.

The taxonomy of the Cannas is about as troublesome as that of any of the Monocotyledons, not because of the original number of species probably, but because they have been cultivated and hybridized since the earliest years of European colonization of America. Pressed specimens do not give a good idea of the habit of the plants, nor of the aspect and color of the flowers and foliage. Early systematic studies of the genus were undertaken, however painstakingly by such enthusiasts as Roscoe, under conditions of greenhouse and garden culture in Europe, and the numerous species proposed mostly upon single specimens of doubtful origin. Most herbaria contain far more specimens of garden hybrid Cannas than of undoubtedly indigenous plants accompanied by adequate data. Such genera are not attractive subjects for professional taxonomists, and as a result *Canna* has suffered from neglect as well as from misunderstanding. Such accounts as that of Kränzlin (in Engl. Pflanzenreich IV. 47. 1912) are obviously pieces of chore-work guided by little biological understanding of the problem, and by no real interest in it.

Under such circumstances, preparation of an account of *Canna* for a Flora such as this is very difficult. Because of our interest in the Scitamineae of Panama generally, the editors have devoted considerable attention to the species of *Canna*, in the field, in the herbarium, and in the library. We also have had the opportunity of examining numerous exsiccatae annotated by Kränzlin, which, however, have been of little actual use since they so frequently fail to coincide with our information from other sources. The following account, therefore, is virtually

independent, and although the definition of the biological entities is probably as satisfactory as may be obtained at present, the nomenclature undoubtedly will bear scrutiny in the light of future monographic study.

In Panama, *Canna* is not a particularly prominent element of the herbaceous flora since the plants do not grow in such conspicuous stands as do various *Heliconias* and *Calatheas*, for example. Their showy flowers, nevertheless, have earned them popular recognition as *Plantanillo* (generally applied to any plant at all resembling a Banana), and *Café cimarron* or *Café silvestre* (because of their hard round seeds). The garden hybrids frequently encountered are known as *Bandera española*. The West Indians call the seeds "Indian shot", and they are occasionally used in boys' popguns. The leaves or roots are reported as used in some districts as domestic medicine for diuretics and emollient poultices. The large leaves, like those of *Heliconias* and *Calatheas*, are employed in the "interior" for wrapping small parcels.

- a. Flowers 4-10 cm. long, yellow, red, or variegated; plants with the true habit of a *Canna*, the inflorescence vertical.
  - b. Staminodia 2; flowers yellow, usually spotted with orange or red, 5-6 cm. long; leaves broadly ovate to ovate-lanceolate, the base broadly obtuse or rounded, then abruptly decurrent to the petiole. 1. *C. LUTEA*
  - bb. Staminodia 3.
    - c. Leaves lanceolate to elliptic-lanceolate, gradually and continuously narrowed to the petiole, glaucous; flowers yellow.
      - d. Flowers 8-9 cm. long; corolla tube about as long as the calyx, the lobes erect or strongly ascending; leaves narrowly lanceolate. 2. *C. GLAUCA*
      - dd. Flowers 9-10 cm. long; corolla tube greatly surpassing the calyx, the lobes reflexed; leaves elliptic-lanceolate. 3. *C. FLACCIDA*
    - cc. Leaves ovate to ovate-elliptic, obtuse or rounded to broadly acute at the base, then abruptly decurrent to the petiole, not glaucous or scarcely so; flowers red, occasionally flushed with yellow at the base.
      - d. Flowers 4-5 cm. long, shortly pedicellate or subsessile; corolla lobes spreading. 4. *C. INDICA*
      - dd. Flowers 6-8 cm. long, the pedicels as long as the ovary or longer; corolla lobes nearly erect. 5. *C. EDULIS*
  - aa. Flowers 10-12 cm. long, white tinged with yellowish green at the tips; plants with the habit of a *Heliconia*, the inflorescence horizontal. 6. *C. LILIIFLORA*

1. *CANNA LUTEA* Mill. Gard. Dict. ed. 8, no. 4. 1768.

*Canna aurantiaca* Rosc. Monandr. Pl. pl. [21]. 1828.

*Canna maculata* Link, Handb. 1:227. 1829.

*Canna commutata* Bouché in Linnaea 8:147. 1833.

*Canna densiflora* Bouché, loc. cit. 18:489. 1844.

*Canna floribunda* Bouché, loc. cit. 1844.

Plants 1.0-1.5 m. tall, glabrous throughout; leaves broadly ovate to ovate-lanceolate, acute to very shortly acuminate, the base broadly obtuse or rounded then abruptly and shortly decurrent to the petiole (sheath), 20-45 cm. long, 10-25 cm. broad; inflorescence erect, racemiform or divided at the base, bearing several or rather few very shortly pedicellate or sessile, solitary or paired flowers; sepals oblong, 0.5-0.7 cm. long; corolla 3.0-3.5 cm. long, the lobes narrowly



oblong-lanceolate, acuminate, the tube about 0.5 cm. long, yellow; staminodia 2, oblanceolate, 5–6 cm. long, yellow spotted with orange or red; capsules oblong-subclavate, 3.0–3.5 cm. long, densely muricate.

Mexico to southern Brazil; Antilles. In wet thickets and open forest, chiefly at fairly low elevations.

CANAL ZONE: Culebra, *Pittier* 2525; Las Cascadas, *Standley* 29689. COCLÉ: Cerro Valle Chiquito, *Seibert* 500; Las Margaritas, *Woodson*, *Allen & Seibert* 1233.

2. *CANNA GLAUCA* L. Sp. Pl. 1. 1753.

*Canna angustifolia* L. Sp. Pl. 1:1. 1767.

*Canna stricta* Bouché in *Linnaea* 12:144. 1838.

*Canna liturata* Link ex Dietr. Syn. Pl. 1:12. 1839.

*Canna Schlechtendaliana* Bouché, loc. cit. 18:487. 1844.

Plants 1.5–2.0 m. tall; leaves rather narrowly lanceolate, acuminate, the base gradually and continually narrowed to the sheath, 30–45 cm. long, 8–15 cm. broad, glabrous and conspicuously glaucous; inflorescence racemiform, simple, bearing several pairs of shortly pedicellate or subsessile flowers; sepals oblong-elliptic, about 1 cm. long; corolla 4.0–4.5 cm. long, yellow, the lobes oblong-lanceolate, acuminate, erect or sharply ascending, the tube about equalling the sepals; staminodia 3, obovate-elliptic, 8–9 cm. long, yellow; capsules irregularly ellipsoid, 4–5 cm. long, 2–3 cm. thick, densely spiny-fimbriate.

Panama to the Guianas and Argentina; Antilles, in lowland thickets and open forest.

BOCAS DEL TORO: Old Bank Island, *von Wedel* 2001.

3. *CANNA FLACCIDA* Salisb. Icon. Stirp. Rar. 3. pl. 2. 1791.

*Canna flava* Michx. ex Lam. in Jour. Nat. Hist. Par. 1:416. 1792.

*Canna elegans* Raf. Fl. Ludovic. 143. 1817.

*Eurystylus flaccida* Bouché in *Linnaea* 18:485. 1844.

Plants 1–2 m. tall, wholly glabrous; leaves elliptic-lanceolate, narrowly acute to acuminate, base gradually and continuously narrowed to the sheath, 20–45 cm. long, 8–11 cm. broad, glaucous; inflorescence racemiform, simple, bearing a few pairs of virtually sessile, showy yellow flowers; sepals oblong-elliptic, 2–3 cm. long; corolla 8–9 cm. long, yellow, the lobes narrowly oblong-lanceolate, sharply reflexed at anthesis, the tube 3–4 cm. long; staminodia broadly obovate, 9–10 cm. long, yellow; capsules irregularly ellipsoid, 5–6 cm. long, 4.0–4.5 cm. thick, spiny-fimbriate.

Coastal plain of South Carolina, Georgia, and Florida; Antilles; Panama. In lowland thickets.

BOCAS DEL TORO: Isla Colón, *von Wedel* 78, 89. CANAL ZONE: Río Pedro Miguel, in garden, *Standley* 30015.



Fig. 42. *Canna flaccida*4. *CANNA INDICA* L. Sp. Pl. 1. 1753.*Canna indica* var. *patens* Ait. Hort. Kew. 1:1. 1789.*Cannacorus indicus* Medic. in Acta Acad. Theod.-palat. 6: Phys. 379. 1790.*Cannacorus ovatus* Moench, Meth. 526. 1794.*Canna patens* (Ait.) Rosc. Trans. Linn. Soc. 8:338. 1807.*Canna sylvestris* Rosc. acc. to Kränzl. in Engl. Pflanzenr. IV. 47:61. 1912, as to Panamanian exsiccatae.

*Canna Warszewiczii* A. Dietr. acc. to Kränzl. loc. cit. 64. 1912, as to Panamanian exsiccatae.

Plants 1-3 m. tall, glabrous throughout; leaves ovate to ovate-elliptic, acute to shortly acuminate, base broadly obtuse or rounded then abruptly and shortly decurrent to the sheath, 15-50 cm. long, 9-20 cm. broad; inflorescence usually branched several times toward the base, bearing numerous paired, shortly pedicellate to subsessile flowers; sepals lanceolate, 0.9-1.2 cm. long; corolla 3-4 cm. long, red frequently flushed with yellow toward the base, the lobes narrowly oblong-lanceolate, narrowly acuminate, spreading, the tube about as long as the sepals; staminodia ob lanceolate, 4-5 cm. long, red frequently flushed with yellow or orange at the base; capsules irregularly ellipsoid, 2-4 cm. long, 1.5-2.5 cm. broad, densely spinose-muricate.

Mexico to southern Brazil; Antilles. Chiefly in lowland thickets and open forest.

BOCAS DEL TORO: Almirante, *Skutch* 13; Talamanca valley, *Carleton* 123. CANAL ZONE: Culebra, *Pittier* 2524; Balboa, *Standley* 25551, 26070. DARIÉN: Boca de Cupe, *Williams* 820. PANAMÁ: Juan Díaz, *Standley* 30486; Panamá, *Maxon*, *Harvey* & *Valentine* 7097.

Although annotated and cited by Kränzlin as representing two distinct species, neither *C. indica*, I cannot reconcile myself to consider these specimens other than a single biological entity. In the absence of more acceptable authority, I am assigning them to *C. indica*, the plates of which, provided by Roscoe, agree sufficiently well with our plants. *C. coccinea* Mill. probably also should be added as a synonym.

5. *CANNA EDULIS* Ker in Bot. Reg. pl. 775. 1823.

*Canna indica* R. & P. Fl. Peruv. 1:1. 1798, non L.

Plants 2-3 m. tall, glabrous throughout; leaves ovate-elliptic, acute to acuminate, base broadly obtuse then abruptly and shortly decurrent to the sheath, 30-65 cm. long, 15-20 cm. broad; inflorescence divided once or twice from the base, bearing numerous pairs of rather long-pedicellate flowers; sepals 1.0-1.2 cm. long; ovary clavate, 0.8-0.9 cm. long; corolla 4.5-5.0 cm. long, the lobes oblong-elliptic, erect or nearly so, the tube shorter than the sepals, bright red to orange; staminodia oblong-ob lanceolate, 6-8 cm. long, free nearly to the base, red; capsules broadly ellipsoid, about 5 cm. long, 2.0-2.5 cm. thick, densely spinose-muricate.

Panama to Peru, Bolivia, and northern Argentina, in moist highland forest.

CHIRIQUÍ: Boquete, *Davidson* 500, *Pittier* 2979; Río Chiriquí Viejo valley, *Seibert* 295, *Allen* 1389.

6. *CANNA LILIFLORA* Warsc. ex Planch. in Fl. Serres 10:211. pl. 1055-1056. 1854; Kränzl. in Engl. Pflanzenreich IV. 47:70. 1912.

Fig. 43. *Canna edulis*

(79)

Plants 2.5–3.0 m. tall, wholly glabrous; leaves subhorizontal, oblong, acuminate, 90–120 cm. long, about 45 cm. broad; inflorescence simple or infrequently branched, horizontally deflexed, bracteate, the bracts about 4 cm. long, subtending solitary, exceedingly showy flowers; sepals oblong, longer than the ovary, green; corolla white, 12–14 cm. long, the lobes oblong-linear, 2 cm. broad; staminodia 3, subequal, apparently distinctly longer than the corolla lobes, about 2.5 cm. broad.



Fig. 44. *Canna liliiflora* (redrawn from Engler)

This description is adapted from that provided by Kränzlin. *Canna liliiflora* apparently was collected but once, by Warszewicz in "Veraguas", a rough designation of earlier days for the whole western half of Panama. Although expeditions from the Missouri Botanical Garden have been on the lookout for it for several years, no trace of it has been found. A truly white *Canna* of such magnificent stature would be a horticultural rediscovery of real distinction.

## MARANTACEAE

Rhizomatous perennial herbs, caulescent or acaulescent, frequently massive; leaves radical or cauline, usually 2-ranked, differentiated into a blade, petiole, and sheath, the petiole hardened and callous at least in part; inflorescence terminating the stem, or scapose and arising directly from the rhizome, spiciform or paniculate, infrequently diffusely cymose, the bracts deciduous or persistent, frequently fairly large and colored and imparting a cone-like aspect to the inflorescence; flowers perfect, very asymmetric, epigynous; sepals 3, free, essentially equal; corolla 3-parted, the lobes connate toward the base, unequal; fertile stamen 1, petaloid, bearing a marginal anther; staminodia 1-5, more or less petaloid, one usually forming a hood about the style; ovary inferior, 3- to 1-celled, sometimes 2 of the cells sterile; fruit a loculicidal capsule, rarely fleshy and indehiscent; seeds provided with a more or less conspicuous aril.

The Marantaceae form a conspicuous element of the herbaceous flora of Panama, particularly in low thickets and marshes. In these places large stands of such species as *Calathea lutea*, with their large broad leaves standing nearly upright and the waxy lower surface directed outward, create a very striking effect. The leaves of several species are used as wrapping paper, frequently for articles of food, as tamales and cakes of native sugar, *carpadurra*. The tuberous rhizomes of *Maranta arundinacea*, known as *Sagú*, yield arrowroot laundry starch.

The Marantaceae have not been spared the general taxonomic neglect accorded the Scitaminales as a whole. In the case of this family, however, confusion does not exist as much in specific as in generic distinctions. Schumann's account of the family for Engler's 'Pflanzenreich' has followed Eichler in a number of very difficult generic segregations, which, in the absence of a contemporary authority, have been ignored in this treatment for the 'Flora of Panama' (cf. Woodson & Schery, Ann. Missouri Bot. Gard. 29:331-335. 1942).

- a. Ovary 3-celled; fruit 3-seeded..... 1. CALATHEA
- aa. Ovary 1-celled; fruit 1-seeded.
  - b. Bracts persistent; rachis closely articulated but scarcely zig-zag.
    - c. Bracts not closely imbricated at anthesis; corolla tube very short; outer staminodia 2, creamy white..... 2. MYROSMA
    - cc. Bracts closely imbricated at anthesis; corolla tube narrow and elongate; outer staminodium 1, white or purple..... 3. ISCHNOSIPHON
  - bb. Bracts caducous.
    - c. Inflorescence lax and relatively few-flowered, the rachis rather distantly flexuose; bracts green; outer staminodia 2, white, very conspicuous and labelliform; fruits nut-like, indehiscent..... 4. MARANTA
    - cc. Inflorescence congested and very many-flowered, the rachis closely and sharply zig-zag.
      - d. Bracts orange or yellow; outer staminodia 2, white or yellowish, subequal; fruits capsular, dehiscent..... 5. STROMANTHE
      - dd. Bracts green; outer staminodium 1, purple; fruits nut-like, indehiscent..... 6. THALIA



## 1. CALATHEA G. F. W. Meyer

CALATHEA G. F. W. Meyer, Prim. Fl. Esseq. 6. 1818.

*Endocodon* Raf. Fl. Tellur. 4:49. 1836.

*Zelmira* Raf. loc. cit. 50. 1836.

*Monostiche* Koernicke in Gartenfl. 7:76, 88. 1858.

Massive to relatively small perennial herbs, caulescent or acaulescent; leaves 2-ranked, less frequently spiral; inflorescence terminating the stem or arising directly from the rhizome, spiciform, simple, solitary or clustered, the bracts usually closely imbricated, persistent, foliaceous to chartaceous or coriaceous and frequently strikingly colored, subtending cincinnate clusters of rather small subsessile, bracteolate flowers; flowers perfect, very asymmetric, epigynous; sepals 3, more or less connate at the base, the lobes essentially equal; corolla lobes 3, unequal, connate at the base into a fairly short tube; fertile stamen 1, petaloid, united at the base with 2-3 more or less conspicuous petaloid staminodia; ovary inferior, 3-celled; fruit a loculicidally dehiscent, 3-seeded capsule.

a. Bracts 2-ranked.

b. Spikes borne upon leafy stems; bracts numerous, closely imbricated.

c. Spikes relatively narrow, the bracts sharply ascending and nearly parallel to the peduncle, heavily coriaceous, yellowish brown usually flushed with red or purple; plants heavily pruinose, particularly the lower surface of the leaves.....

1. *C. LUTEA*

cc. Spikes relatively broad, the bracts widely spreading or nearly horizontal to the peduncle; plants not pruinose.

d. Bracts glabrous or essentially so, chartaceous, rich yellow, nearly horizontal to the peduncle, not recurved at the tip or scarcely so; leaves ovate to broadly elliptic.....

2. *C. INSIGNIS*

dd. Bracts densely pilose, membranaceous, pale yellowish green, widely spreading, rather strongly recurved at the tip; leaves oblong to oblong-lanceolate.....

3. *C. LASIOSTACHYA*

bb. Spikes borne upon naked scapes; bracts very few, relatively distant, not imbricated at anthesis, densely pilose.....

4. *C. VILLOSA*

aa. Bracts spiral.

b. Spikes borne upon leafy stems.

c. Stem leaves distant, occasionally approximate in lax groups of 2-3.

d. Bracts green, rarely yellow, relatively numerous (about 15-30); petioles of upper stem leaves usually fairly elongate and only partly callous.

e. Spikes with relatively long peduncles; bracts green, broadly obtuse or rounded, frequently lacerate in age.

f. Bracts deep green, closely imbricated at anthesis or only slightly spreading at the tip; flowers sharply ascending, deep violet or pale yellow; plants 1.0-2.0 m. tall.....

5. *C. ALLOUIA*

ff. Bracts pale green, irregularly reflexed or spreading at anthesis; flowers lax, pale yellow; plants 2.0-2.5 m. tall.....

6. *C. INDECORA*

ee. Spikes sessile or with a much shorter peduncle; bracts yellow, deeply round-emarginate, usually with an inconspicuous central cusp, closely imbricated at anthesis; flowers yellow; plants about 1 m. tall.....

7. *C. ALLENII*

dd. Bracts white, yellow, or bronze, relatively few (about 5-15); petioles of upper stem leaves usually very short and wholly callous; flowers white.

e. Bracts yellow, about 10-15, imbricated at anthesis, tomentose toward the base, chartaceous; peduncles glabrous; petioles of upper stem leaves 1-3 cm. long, the sheaths obtuse, not auriculate.....

8. *C. LAGUNAE*

- ee. Bracts bronze, 5-10, widely spreading, glabrous, chartaceous; peduncles glabrous; petioles of upper stem leaves 0.3-0.6 cm. long, the sheaths auriculate. 9. *C. PICTA*
- eee. Bracts white or yellowish at the base, about 5-10, loosely sheathing, glabrous, delicately membranaceous; peduncles densely and minutely puberulent; petioles of upper stem leaves 0.5-2.0 cm. long. 10. *C. WARSCEWICZII*
- cc. Stem leaves densely whorled beneath the inflorescence; bracts laxly spreading at anthesis, tomentose. 11. *C. FOLIOSA*
- bb. Spikes borne upon leafless scapes.
- c. Spikes subsessile or very shortly (about 1-3 cm.) pedunculate, the bracts relatively few, 3-4 cm. long, membranaceous, green or tinged with red; flowers bright yellow, 2.5-4.0 cm. long; plants 3-4 dm. tall. 12. *C. PANAMENSIS*
- cc. Spikes with elongate peduncles.
- d. Plants massive, 1.5-5.0 m. tall; spikes broadly ovoid, 5-12 cm. long, very dense; bracts numerous, subcoriaceous, yellow flushed with red, irregularly lacerate; flowers pale greenish yellow, 3.0-3.5 cm. long. 13. *C. ALTISSIMA*
- dd. Plants slender, 1.5-4.0 dm. tall; spikes turbinate, 1.5-2.5 cm. long, rather lax; bracts few, foliaceous, lanceolate or ovate-lanceolate, entire; flowers white, 1.0-1.5 cm. long. 14. *C. MICROCEPHALA*

Fig. 45. *Calathea lutea*1. *CALATHEA LUTEA* (Aubl.)

G. F. W. Meyer, Prim. Fl.

Esseq. 10. 1818.

*Maranta lutea* Aubl. Hist. Pl. Guian. 1:4. 1775.*Maranta Casupo* Jacq. Fragm. Bot. 51. pl. 63, fig. 4. 1809.*Maranta Cachibou* Jacq. loc. cit. 52. pl. 69-70. 1809.*Calathea discolor* G. F. W. Meyer, loc. cit. 7. 1818.*Calathea Casupito* G. F. W. Meyer, loc. cit. 10. 1818.*Calathea marantina* K. Koch. in Gartenzeit. 25:163. 1857.

Plants very stout, 1-5 m. tall, caulescent; leaves long-petiolate, broadly elliptic to suborbicular, obtuse or abruptly acuminate, the base obtuse or rounded then very abruptly and shortly decurrent, 20-150 cm. long, 15-60 cm. broad, glabrous, conspicuously pruinose, particularly the lower surface; callus 5-12 cm. long; inflorescence terminating the leafy stem, consisting of 2-several pedunculate, flattened, oblong, ellipsoid spikes 15-40

cm. long, 3-5 cm. broad; bracts 2-ranked, more or less conduplicate, nearly orbicular, 3.5-4.5 cm. long and broad, sharply ascending and nearly parallel to the rachis, heavily coriaceous, yellowish brown usually flushed with red or purple, glabrous to rather conspicuously appressed-tomentose; flowers white or very pale yellow, occasionally purplish, 4.0-4.5 cm. long, well exerted from the bracts.

British Honduras to Brazil and Peru; Antilles, in coastal thickets and marshes.

BOCAS DEL TORO: Isla Colón, von Wedel 311; Old Bank Island, von Wedel 1996. CANAL ZONE: Río Indio, Dodge & Allen 17474; Cerro Gordo, Standley 26016; Barro Colorado Island, Standley 40835; Gatún, Hayes 820. COCLÉ: Penonomé, Williams 387. COLÓN: Catival, Standley 30228. CHIRIQUÍ: San Bartolomé, Woodson & Schery 914. DARIÉN: Boca de Cupe, Allen 880; Río Sambú, Pittier 5559. PANAMÁ: Río Tecúmen, Standley 29453.

One of the most common and striking plants of coastal marshes. The lower surface of the leaves is covered with wax which shreds off as thin flakes. Popularly but ambiguously known as *Platanillo*, and, more appropriately, *Hoja blanca*.

2. *CALATHEA INSIGNIS* Peters. in Mart. Fl. Bras. 3<sup>3</sup>:124. 1890.

*Calathea quadratispica* Woodson in Ann. Missouri Bot. Gard. 26:278. 1939.

Plants stout, caulescent, 2-3 m. tall; leaves long-petiolate, ovate to ovate-elliptic, shortly acuminate, broadly rounded or obtuse at the base, 35-75 cm. broad, glabrous; callus stout, 4-15 cm. long; inflorescence terminating the leafy stem, consisting of 1-3 pedunculate, flattened, broadly oblong spikes 15-40 cm. long, 3-6 cm. broad; bracts 2-ranked, conduplicate, broadly reniform, 3.0-3.5 cm. long, 5-6 cm. broad, nearly horizontal to the rachis, heavily chartaceous, bright yellow, glabrous or very indefinitely puberulent-papillate; flowers 3.0-3.5 cm. long, pale yellow.

Mexico to Colombia and Peru, in coastal thickets and marshes.

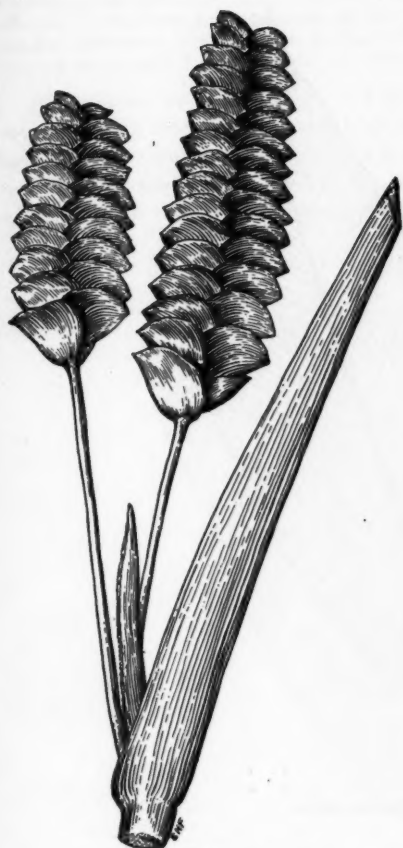
BOCAS DEL TORO: Río Cricamola, Woodson, Allen & Seibert 1913; Isla Colón, von Wedel 312. CANAL ZONE: Frijoles, Pittier 2684; Barro Colorado Island, Standley 41003. CHIRIQUÍ: Río Gariché, Seibert 363. COLÓN: Río Sirri, Pittier 4012; Porto Bello, Pittier 2486.

3. *CALATHEA LASIOSTACHYA* Donn. Sm. in Bot. Gaz. 31:124. 1901.

Plants fairly stout, about 2 m. tall, caulescent; leaves long-petiolate, narrowly oblong to oblong-lanceolate, shortly acuminate, the base broadly obtuse, 40-75 cm. long, 10-18 cm. broad, glabrous; callus 4-6 cm. long; inflorescence terminating the leafy stem, consisting usually of 2 long-pedunculate spikes 9-14 cm. long, 5-7 cm. broad; bracts 2-ranked, strongly conduplicate, broadly oblong-elliptic, rounded above and below, 3.5-4.0 cm. long, 2.0-2.5 cm. broad, widely spreading, rather strongly recurved at the tip, membranaceous, pale yellowish green, densely pilose; flowers 3-4 cm. long, pink or cream tinged with pink.

Costa Rica and Panama, chiefly in wet foothill thickets and open forest.

CANAL ZONE: Caño Quebrada, Pittier 6826. COCLÉ: El Valle de Antón, Woodson & Schery 197; La Mesa, Allen 2734. COLÓN: Fato, Pittier 4103.

Fig. 46. *Calathea insignis*Fig. 47. *Calathea lasiostachya*

4. *CALATHEA VILLOSA* (Lodd.) Lindl. in Bot. Reg. pl. 14. 1845.

*Phrynium villosum* Lodd. in Sweet, Hort. Brit. 392. 1826.

*Calathea pardina* Planch. & Lind. Prix Courant Fl. Nouv. 2. 1855; Fl. Serres 11:55. pl. 1101, 1102. 1856.

*Calathea hirsuta* Standl. in Jour. Wash. Acad. Sci. 15:4. 1925.

Plants of moderate size, 5-8 dm. tall, acaulescent; leaves all basal, oblong-elliptic, shortly acuminate, base obtuse to broadly acute, 15-60 cm. long, 8-15 cm. broad, scattering pilosulose beneath, particularly the midrib; petiole 1.5-6.0 cm. long, pilose, callous throughout or for about half its length; sheaths narrow, 30-45 cm. long, pilose; inflorescence terminating a slender leafless pilose scape

Fig. 48. *Calathea villosa*

40–75 cm. long; bracts 4–7, 2-ranked, somewhat compressed, not imbricated, rather distant, broadly ovate, shortly acuminate, 2–3 cm. long, 1.5–2.0 cm. broad, foliaceous, densely pilose; flowers 3.5–4.0 cm. long, yellow.

Costa Rica to Brazil, chiefly in lowland thickets and open forests.

CANAL ZONE: Las Cruces, *Seibert* 581; Cerro Cabra, *Allen* 2021; Ancón Hill, *Standley* 25163. PANAMÁ: Bejuco, *Woodson, Allen & Seibert* 1681.

The leaves of this species usually are mottled with splotches of deep blue-green.

5. *CALATHEA ALLOUIA* (Aubl.) Lindl. in Bot. Reg. *pl.* 1210. 1827; Woodson & Schery in Ann. Missouri Bot. Gard. 29:332. 1942.

*Merantia Allouia* Aubl. Hist. Pl. Guian. 1:3. 1775.

*Curcuma americana* Lam. Encycl. Meth. Bot. 2:228. 1806.



*Calathea grandifolia* Lindl. in Bot. Reg. pl. 1210. 1827.

*Phrynium cylindricum* Rosc. Monandr. Pl. pl. [40]. 1828.

*Calathea cylindrica* (Rosc.) K. Sch. in Engl. Pflanzenreich. IV. 48:83. 1902.

*Calathea macrosepala* K. Sch. loc. cit. 84. 1902.

Plants rather stout, caulescent, 1-2 m. tall; leaves oblong to oblong-elliptic, obtuse to very shortly acuminate, base broadly obtuse or rounded, 15-45 cm. long, 8-25 cm. broad, glabrous; petiole 2-20 cm. long, wholly callous or only in the upper portion; sheath 15-30 cm. long, inconspicuously pilosulose; spikes terminating the leafy stem, solitary; peduncle 7-20 cm. long, pilosulose; bracts

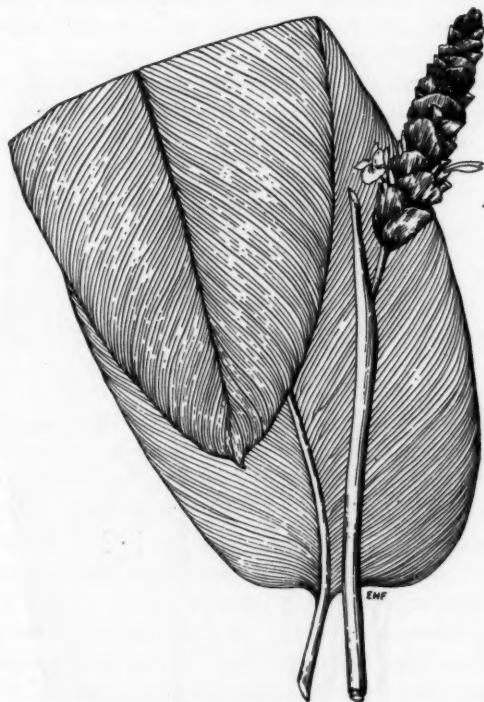


Fig. 49. *Calathea Allouia*

about 15-30, closely imbricated except at the spreading canaliculate tip, ovate-subreniform, broadly obtuse or rounded, 1.5-2.0 cm. long, 2-3 cm. broad, foliaceous, pilosulose; flowers 3-4 cm. long, sharply ascending, pale yellow or violet.

British Honduras to Brazil and Peru, chiefly in lowland thickets and open forest.

CANAL ZONE: Frijoles, Killip 3430; Gatún, Pittier 6746; Barro Colorado Island, Shattuck 487. CHIRIQUÍ: San Felix, Pittier 5150. COCLÉ: Cerro Valle Chiquito, Seibert 647. COLÓN: Palenque, Pittier 4129. DARIÉN: Yape, Allen 861. PANAMÁ: Bella Vista,

Killip 12032; Sabanas, Paul 103; Río Tataré, Woodson & Schery 1011 (yellow-flowered), Woodson & Schery 1010 (violet-flowered); between Pacora and Chepo, Woodson, Allen & Seibert 1669 (yellow-flowered), Woodson, Allen & Seibert 1670 (purple-flowered).

This species is common, particularly in the savannas east of Panama City, and produces yellow or violet-colored flowers in about equal numbers. The two color forms are distinguishable by no morphological characters; hence both are cited in the preceding list of exsiccatae, as collectors' labels frequently neglect notes on flower color. The yellow form is typical of the species as originally described; the violet color form may be distinguished as follows:



Fig. 50. *Calathea indecora*

- 5a. *CALATHEA ALLOUIA* (Aubl.) Lindl. var. *VIOLACEA* (Rosc.) Woodson in Ann. Missouri Bot. Gard. 29:332. 1942.

*Pbrynum violaceum* Rosc. Monandr. Pl. pl. [37]. 1828.

*Maranta clavata* Velloso, Fl. Flum. 1: pl. 9. 1828.

*Pbrynum floribundum* Lem. Jard. Fleur. 2: misc. 96. pl. 189. 1852.

6. *CALATHEA INDECORA* Woodson in Ann. Missouri Bot. Gard. 29:333. 1942.

Stout plants 2.0–2.5 m. tall, caulescent; leaves long-petiolate, oblong-elliptic, shortly acuminate, base rounded, 40–65 cm. long, 14–22 cm. broad, minutely puberulent beneath, midrib puberulent above, otherwise glabrous; petiole 20–45 cm. long, minutely pilosulose, the callus about 4 cm. long, densely papillate; sheath 11–20 cm. long, not auriculate; spikes broadly ovoid, 5–8 cm. long; peduncle stout, 10–18 cm. long, puberulent above; bracts about 15–30, very broadly ovate, about 2 cm. long and broad, pale green, densely pilosulose, lacerate and loosely spreading at anthesis; flowers loosely spreading at anthesis, 2.5–3.0 cm. long, pale yellow.

Panama, in lowland thickets.

BOCAS DEL TORO: Isla Colón, von Wedel 476; Old Bank Island, von Wedel 2102; Water Valley, von Wedel 712.

Closely related to *C. Allouia*, but easily distinguished in the field by its larger size and disorderly appearance of the spikes. Probably occurs in adjacent Costa Rica.

7. *CALATHEA ALLENII* Woodson in Ann. Missouri Bot. Gard. 29:331. 1942.

Plants rather stout, caulescent, about 1 m. tall; leaves fairly long-petiolate, oblong-elliptic, abruptly subcaudate-acuminate, base rounded, 20–45 cm. long, 8–15 cm. broad, glabrous except the midrib puberulent beneath; petiole 20–25 cm. long, pilosulose, callus about 5 cm. long; sheath 7–10 cm. long, 4 cm. broad, pilosulose without; spikes broadly fusiform, 11–13 cm. long, 3.0–3.5 cm. broad, sessile or with a densely pilosulose peduncle 4 cm. long; bracts spiral, about 20–25, densely imbricated, oblong or the lower broadly oval, round-emarginate with a minute median cusp, 5.0–5.5 cm. long, 1.5–3.5 cm. broad, yellow, the margins and tip pilosulose to glabrate; flowers ascending, 3.5–4.0 cm. long, yellow.

Panama, in highland forest.

PANAMÁ: Cerro Campana, Allen 2218.

8. *CALATHEA LAGUNAE* Woodson in Ann. Missouri Bot. Gard. 29:333. 1942.

Plants nearly 1 m. tall, caulescent; leaves very shortly petiolate, oblong-elliptic or oval, 11–45 cm. long, 7–12 cm. broad, glabrous; petiole 1–6 cm. long, callous throughout and minutely papillate; sheath 6–15 cm. long, obtuse, glabrous; spikes ovoid, 3–6 cm. long, peduncle 10–17 cm. long, pilosulose above, otherwise glabrous; bracts spiral, about 10–15, imbricated, subreniform-ovate, broadly obtuse

or rounded, 1-2 cm. long, yellow, densely pilosulose particularly at the base; flowers ascending, 2.0-2.5 cm. long, white.

Panama, in lowland thickets.

BOCAS DEL TORO: Western River, von Wedel 2706; Isla Colón, von Wedel 1328.



Fig. 51. *Calathea Allenii*



Fig. 52. *Calathea lagunae*

9. *CALATHEA PICTA* Hook. f. in Bot. Mag. pl. 7674. 1899; Woodson & Schery in Ann. Missouri Bot. Gard. 29:334. 1942.

Plants 1.0–1.5 m. tall, caulescent; leaves broadly oblong-elliptic, very shortly and abruptly acuminate, base rounded-subtruncate, 15–30 cm. long, 7–14 cm. broad, glabrous except the puberulent midrib above; petiole 0.3–1.0 cm. long, wholly callous; sheaths 10–15 cm. long, auriculate at the petiole, glabrous; spikes ellipsoid, 4–6 cm. long; peduncle 13–20 cm. long, glabrous; bracts about 5–10,



Fig. 53. *Calathea picta*

widely spreading, chartaceous, glabrous, bronze-colored, broadly ovate-subreniform, 1.5–2.0 cm. long, 2.0–2.5 cm. broad, shortly apiculate; flowers 5.0–5.5 cm. long, widely exserted, white.



Panama; originally published from cultivated plants presumably obtained from Brazil. In Panama occurring in foothill and highland forest and thickets.

COCLÉ: El Valle de Antón, *Allen 1217*; La Mesa, *Allen 2331*. PANAMÁ: Cerro Campana, *Allen 2219*.

10. *CALATHEA WARSCIEWICZII* (Mathieu) Koernicke in *Gartenfl.* 7:87. 1858.

*Maranta Warscewiczii* Mathieu ex Planch. in *Fl. Serres* 9:209. *pl.* 939-940. 1854.

*Phrynium Warscewiczii* (Mathieu) Klotzsch in *Allgem. Gartenzeit.* 23:89. 1855.

Plants rather slender, caulescent, 0.5–1.0 m. tall; leaves oblong-oval, abruptly and shortly acuminate or subcauliculate-acuminate, base obtuse or rounded, 9–30 cm. long, 5–10 cm. broad, minutely puberulent to glabrous, the lower surface purple, the upper variegated with white or light green; petiole 0.5–2.0 cm. long, wholly callous; sheaths 9–15 cm. long, obtuse, minutely puberulent; spikes ellipsoid-turbinate, 3.5–6.0 cm. long; peduncle 5–12 cm. long, minutely pilosulose; bracts about 5–10, loosely sheathing, obovate, shortly apiculate, 2–4 cm. long, 3–5 cm. broad, membranaceous, white or yellowish at the base, glabrous; flowers 3.5–4.0 cm. long, widely exserted, white.

Costa Rica and Panama, in moist lowland and foothill forests.

BOCAS DEL TORO: Water Valley, *von Wedel 1586, 2655*; Isla Colón, *von Wedel 1270*; Rubbertree Station, vicinity of Almirante, *Stork 119*.

A very lovely species sometimes found in northern greenhouses.

11. *CALATHEA FOLIOSA* Rowlee ex Woodson in *Ann. Missouri Bot. Gard.* 29:332. 1942.

Plants rather slender, caulescent, about 1 m. tall or less; stem leaves densely whorled beneath the flowering peduncle, oblong-oblancoate, shortly acuminate, base obtuse, 25–35 cm. long, 7–8 cm. broad, glabrous except the puberulent midrib beneath; petiole about 1 cm. long, wholly callous; sheaths 15–20 cm. long, obtuse, glabrous; spikes subglobose, about 6 cm. long; peduncle about 9 cm. long, glabrous; bracts about 25, more or less imbricated, broadly ovate, shortly acuminate, 2–3 cm. long, densely tomentellous without; flowers about 3.0–3.5 cm. long, yellowish.

Panama, probably also in adjacent Costa Rica, in lowland thickets.

BOCAS DEL TORO: Farm No. 6, near Almirante, *Blair 1016*.

Noteworthy for the whorled stem leaves. Possibly a form of *C. indecora*.

12. *CALATHEA PANAMENSIS* Rowlee, ex Standl. *Jour. Wash. Acad. Sci.* 15:4. 1925.

Plants of mediocre size, acaulescent; leaves oblong- or obovate-elliptic, very abruptly and shortly acuminate to obtuse or rounded, base very broadly obtuse or rounded, 15–20 cm. long, 7–10 cm. broad, glabrous; petioles 0.5–1.0 cm. long, wholly callous, minutely puberulent; sheaths 8–16 cm. long, narrow, obscurely

Fig. 54. *Calathea panamensis*

auriculate, glabrous or essentially so; spikes arising directly from the rhizome, subsessile or very shortly (about 4 cm.) pedunculate; bracts about 5-10, ovate-lanceolate, acute to acuminate, 3-4 cm. long, membranaceous, green or tinged with red, sparsely pilosulose to glabrate; flowers 2.5-4.0 cm. long, bright yellow.

Costa Rica and Panama, in lowland thickets and savannas.

PANAMÁ: Cabuya, Allen 2556; Río Tataré, Woodson & Schery 1007; Río Tapia, Maxon & Harvey 6664; between Pacora and Chepo, Woodson, Allen & Seibert 1644; Matías Hernández, Pittier 6806.

These plants may eventually be found to be conspecific with one of the South American species of the *C. cbrysoleuca* complex.

13. *CALATHEA ALTISSIMA* (Poeppig & Endl.) Koern. in Bull. Soc. Nat. Moscow 35<sup>1</sup>:141. 1862.



Fig. 55. *Calathea altissima*

*Phrynium altissimum* Poeppig & Endl. Nov. Gen. & Sp. 2:20. 1838.

*Phyllodes inocephalum* O. Ktze. Rev. Gen. 2:694. 1891.

Very stout acaulescent plants; leaves very long-petiolate, broadly oval, 45-70 cm. long, 25-35 cm. broad, obtuse or rounded at the tip, base rounded, glabrous; petiole stout, 9-12 dm. long, callus 4-12 cm. long, glabrous; sheath 4-8 dm. long, obtuse; spikes subglobose, very long-pedunculate, 5-12 cm. long; peduncle 5-8 dm. long, glabrous; bracts very numerous, about 5 cm. long, coriaceous, deeply and indefinitely lacerate, pale yellow flushed with rose, margins green; flowers 4-5 cm. long, pale yellow.

Guatemala to the Guianas and Peru, in lowland thickets and open forest.

BOCAS DEL TORO: Isla Colón, von Wedel 355. CANAL ZONE: Río Culebra, Pittier 4159; Matachin, Kuntze 1916; Barro Colorado Island, Bailey & Bailey 16. CHIRIQUÍ: Puerto Armuelles, Woodson & Schery 850; San Bartolomé, Woodson & Schery 893. DARIÉN: El Real, Allen 950.

Very conspicuous plants, the spikes looking like gigantic, over-used bottle brushes.

14. *CALATHEA MICROCEPHALA* (Poeppig & Endl.) Koern. in Bull. Soc. Nat. Moscow 35<sup>1</sup>:125. 1862; Woodson & Schery in Ann. Missouri Bot. Gard. 29:334. 1942.

*Phrynium microcephalum* Poeppig & Endl. Nov. Gen. & Sp. 2:20. pl. 128, figs. a-b. 1838. *Maranta micans* Mathieu, Cat. 1853.

*Calathea micans* (Mathieu) Koern. loc. cit. 126. 1862.

*Calathea albicans* Brongn. ex K. Sch. in Engl. Pflanzenreich IV. 48:112. 1902.

Fig. 56. *Calathea microcephala*

Slender acaulescent herbs; leaves ovate- to oblong-elliptic, acute to shortly acuminate, base obtuse or rounded, 6-15 cm. long, 2.5-8 cm. broad, glabrous, lower surface usually purple, the upper variegated with white or pale green; petiole 1.5-10.0 cm. long, shortly callous above; sheaths very slender, 3-6 cm. long; spikes very long-pedunculate, turbinate, 1.5-2.5 cm. long, rather lax, the bracts few, lanceolate or ovate-lanceolate, acute to acuminate, entire, 0.7-1.3 cm. long, foliaceous, glabrous or minutely pilosulose, rather loosely sheathing; flowers white, or the labellum blue, 1.0-1.5 cm. long.

Guatemala to Brazil and Peru, in moist lowland and foothill thickets and open forest.

BOCAS DEL TORO: Isla Colón, von Wedel 257; Water Valley, von Wedel 1585; Old Bank Island, von Wedel 1919; Nievécita, Woodson, Allen & Seibert 1815. CANAL ZONE: Frijoles, Standley 27534; between Gorgona and Gatún, Pittier 2277. COCLÉ: El Valle de Antón, Woodson & Schery 186, Allen 2174.

A lovely species frequently found in northern greenhouses.

## 2. MYROSMA L. f.

MYROSMA L. f. Suppl. 8, 80. 1781.

*Sarantbe* Eichl. in Abh. Akad. Berlin 1883:85. 1883, in part.

*Ctenanthe* Eichl. loc. cit. 83. 1883, in part.

Rhizomatous, perennial, subacaulescent herbs; leaves mostly basal, the flowering stem bearing relatively few, 2-ranked; inflorescence racemose, subsPICIFORM, simple or infrequently branched, solitary or clustered; bracts persistent, usually relatively distant and not closely imbricated at anthesis, membranaceous or chartaceous, foliaceous or yellow, subtending clusters of rather small and inconspicuous bracteolate flowers; flowers perfect, very asymmetric, epigynous; sepals 3, more or less connate at the base, persistent, the lobes essentially equal; corolla lobes 3, unequal, shortly connate at the base; fertile stamen 1, petaloid, united at the base with 4 more or less petaloid staminodia, the outer 2 exceeding the corolla lobes; ovary inferior, 1-celled; fruit a loculicidally dehiscent 1-seeded capsule.

- |  |                         |
|--|-------------------------|
| a. Bracts green; flowers distinctly pedicellate, conspicuously exerted from the bracts | 1. <i>M. PANAMENSIS</i> |
| aa. Bracts deep yellow; flowers sessile or subsessile, included within the bracts      | 2. <i>M. DASYCARPA</i>  |

1. *MYROSMA PANAMENSIS* Standl. in Jour. Wash. Acad. Sci. 15:4. 1925.

Plants fairly stout, caulescent, 3–6 dm. tall; leaves obovate-elliptic, obtuse to broadly acute, base obtusely cuneate, 15–40 cm. long, 7–16 cm. broad, inconspicuously puberulent toward the base above, otherwise glabrous; petioles 0.3–1.0 cm. long, wholly callous, minutely puberulent; sheath 10–15 cm. long, glabrous; flowering stem 15–30 cm. long, bearing 2–3 somewhat reduced leaves; spikes solitary or in clusters of 2–3 at the tip of the stem, 7–12 cm. long, shortly pedunculate; bracts rather distantly 2-ranked, 14–20, foliaceous, conduplicate, obovate-oblong, 2.0–2.5 cm. long, about 1 cm. broad, broadly obtuse, nearly horizontal; flowers distinctly (about 0.3 cm.) pedicellate, exerted from the bracts, 2.0–2.5 cm. long, creamy white.

Panama, in moist lowland forest.

CANAL ZONE: Madden Dam, Dodge, Steyermark & Allen 16502. PANAMÁ: Río Maestra, Allen 4; Río Tecúmen, Standley 26738.

I have not been able to examine specimens of *M. Hoffmannii* K. Sch., of Costa Rica, to which this species must be very closely related.

2. *MYROSMA DASYCARPA* (Donn. Sm.) Woodson in Ann. Missouri Bot. Gard. 29:335. 1942.

*Calathea dasycarpa* Donn. Sm. in Bot. Gaz. 31:123. 1901.

*Ctenanthe dasycarpa* (Donn. Sm.) K. Sch. in Engl. Pflanzenreich IV. 48:153. 1902.

Stout caulescent herbs 2–4 m. tall; leaves chiefly basal, oblong-elliptic, 20–50 cm. long, 10–20 cm. broad, very shortly and abruptly acuminate, base broadly and inequilaterally obtuse or rounded, the midrib above and lower margin puberulent-ciliate, otherwise glabrous; petiole 9–20 cm. long, much shorter on the upper stem leaves, callous near the blade, matted-pilosulose; sheaths 15–25 cm. long, pilose; flowering stem 1–2 m. tall, pilose, bearing several more or less reduced leaves, dichotomously branched above, and bearing the spikes paired or in clusters of 3–5; spikes shortly pedunculate, flattened, 7–12 cm. long; bracts deep yellow, relatively distant at anthesis, strongly conduplicate, 1–2 cm. long, 0.8–1.0 cm. broad at the middle, broadly acute, the margins densely ciliate to glabrate; flowers 1.0–1.5 cm. long, sessile or subsessile, white.

Costa Rica and Panama, in moist foothill forest.

BOCAS DEL TORO: Isla Colón, von Wedel 433. COCLÉ: El Valle de Antón, Woodson & Schery 165. PANAMÁ: Cerro Campana, Allen 2221.



Fig. 57. *Myrosma dasycarpa*

## 3. ISCHNOSIPHON Koernicke

ISCHNOSIPHON Koern. in Nouv. Mem. Soc. Nat. Moscow 11:346. pl. 10-II. 1859.  
*Pleiotachys* K. Sch. in Engl. Pflanzenreich IV. 48:164. 1902.

Stout rhizomatous, caulescent, perennial herbs; leaves 2-ranked, chiefly basal; inflorescence spicate, solitary or clustered; bracts persistent, closely imbricated, chartaceous or subcoriaceous, subtending small clusters of sessile or subsessile flowers; sepals 3, free, equal; corolla with a long slender tube, the limb 3-lobed; staminodia 2-3, the outer solitary, petalaceous; fertile stamen 1; ovary inferior, 1-celled; fruit a 1-seeded, loculicidally dehiscent capsule.

- |  |                          |
|--|--------------------------|
| a. Spikes narrowly cylindrical, occasionally interrupted | 1. <i>I. LEUCOPHAEUS</i> |
| aa. Spikes strongly compressed, continuous.              |                          |
| b. Bracts glabrous, pruinose.                            |                          |
| c. Spikes pedunculate                                    | 2. <i>I. PRUINOSUS</i>   |
| cc. Spikes sessile                                       | 3. <i>I. PITTIERI</i>    |
| bb. Bracts conspicuously ferruginous-pilose              | 4. <i>I. MORLAEI</i>     |

1. *ISCHNOSIPHON LEUCOPHAEUS* (Poeppig & Endl.) Koernicke in Bull. Soc. Nat. Moscow 35<sup>1</sup>:91. 1862.

*Calathea leucophaea* Poeppig & Endl. Nov. Gen. & Sp. 2:21. pl. 129. 1838.

*Calathea leucocephala* D. Dietr. Synops. 1:7. 1839.

Plants 1–2 m. tall, glabrous throughout; leaves chiefly basal, broadly oval, very abruptly and shortly acuminate, base broadly rounded-subtruncate, 15–30 cm. long, 12–20 cm. broad, glabrous, pruinose beneath; petiole 2–20 cm. long,



Fig. 58. *Ischnosiphon leucophaeus*

the callus 1.5–3.0 cm. long; sheath 6–20 cm. long; spikes usually in clusters of 2–6, sessile, narrowly cylindrical, 10–15 cm. long; bracts oblong, obtuse, 2.5–3.0 cm. long, glabrous, somewhat pruinose; flowers 3–4 cm. long, white.

Panama to Brazil, in coastal swamps and lowland thickets.

CANAL ZONE: Río Chagres, *Fendler 337*; Barro Colorado Island, *Standley 41010*; Ft. Sherman, *Standley 31067*. BOCAS DEL TORO: Isla Colón, *von Wedel 252*. PANAMÁ: Taboga Island, *Standley 28028*; Río Tapia, *Standley 28126*.

2. *ISCHNOSIPHON PRUINOSUS* (Reg.) Peters. in Bot. Tidskr. 18:264. pl. 18. 1892.



Fig. 59. *Ischnosiphon pruinosa*

(99)

*Maranta pruinosa* Regel in Gartenfl. 27:104. 1878.

*Pleiotachya pruinosa* (Reg.) K. Sch. in Engl. Pflanzenreich IV. 48:165. 1902.

Plants stout, 2-3 m. tall; leaves mostly basal, long-petiolate, oblong-elliptic, abruptly and shortly acuminate, base very broadly obtuse or rounded, 20-45 cm. long, 12-18 cm. broad, glabrous; petiole 6-30 cm. long, the upper portion stoutly callous; sheath 30-45 cm. long; spikes in 2-3 long (10-20 cm.) pedunculate clusters, laterally compressed, 12-16 cm. long, about 1.5 cm. broad; bracts closely imbricated, ovate-oblong, acute, 3-5 cm. long, pale green to yellowish, glabrous, pruinose; flowers 4-5 cm. long, white, the outer staminode frequently purple.

British Honduras to Panama, in lowland thickets.



Fig. 60. *Ischnosiphon Morlani*

CHIRIQUÍ: San Bartolomé, Woodson & Schery 888. CANAL ZONE: Quebrada Ancha, Steyermark & Allen 17129; Ft. Sherman, Standley 31092; Gatún, Hayes 110; Barro Colorado Island, Standley 41052. PANAMÁ: Río Tapia, Standley 411; Juan Díaz, Killip 3110.

3. *ISCHNOSIPHON PITTIERI* (Rowlee) Woodson in Ann. Missouri Bot. Gard. 29:335. 1942.

*Pleiotachya Pittieri* Rowlee ex Standl. Jour. Wash. Acad. Sci. 15:5. 1925.

Plants about 1 m. tall; leaves mostly basal, elliptic-oblong, shortly and abruptly acuminate, base rounded, 30–45 cm. long, 12–15 cm. broad, glabrous; petiole and sheath 60–75 cm. long, the callus about 4 cm. long; spikes paired, sessile, 15–18 cm. long, about 1.3 cm. broad, strongly flattened; bracts ovate, acute, 2.0–2.5 cm. long, closely imbricated, glabrous, pale yellowish green with conspicuous red margins; flowers 3.5–4.0 cm. long, white.

Panama, in lowland forest, probably also in northwestern Colombia.

SAN BLAS: Puerto Obaldía, Pittier 4409.

4. *ISCHNOSIPHON MORLAEI* Eggers in Bot. Centralbl. 53:307. 1893.

*Pleiotachya Morlaei* (Eggers) K. Sch. in Engl. Pflanzenreich IV. 48:165. 1902.

Plants 1.5–2.0 m. tall; leaves mostly basal, narrowly ovate-elliptic, shortly and abruptly acuminate, base broadly rounded, 40–75 cm. long, 12–25 cm. broad, essentially glabrous; petiole 15–20 cm. long, the upper portion callous; sheath 20–30 cm. long; spikes clustered at the tip of paired peduncles 9–15 cm. long, strongly compressed, 12–15 cm. long, 1.5–2.0 cm. broad; bracts oblong-ovate, acute, 4–5 cm. long, pale yellowish green, very conspicuously ferruginous-pilose; flowers 4.0–4.5 cm. long, white, the outer staminodium usually purple.

Costa Rica to Ecuador, in lowland thickets and open forest, frequently in marshes.

BOCAS DEL TORO: Isla Colón, von Wedel 208; lower Changuinola River, Stork 79. DARIÉN: El Real, Allen 965.

#### 4. MARANTA L.

*MARANTA L.* Sp. Pl. 2. 1753.

Caulescent herbs from tuberiferous rhizomes; leaves both basal and cauline; stem branching rather diffusely and bearing at the tips rather loose racemiform cymes of rather small, pedicellate flowers subtended by caducous, somewhat foliaceous bracts; sepals 3, free, equal; corolla with a more or less prominent tube, the lobes subequal; staminodia 3–4, the outermost 2 very conspicuous and labelliform; fertile stamen 1, petaloid; ovary inferior, 1-celled; fruit nut-like and indehiscent, 1-seeded.

1. *MARANTA ARUNDINACEA L.* Sp. Pl. 2. 1753.

*Maranta silvatica* Rosc. in Trans. Linn. Soc. 8:340. 1807.

*Maranta indica* Tuss. Fl. Antil. 1:183. pl. 26. 1808.

*Maranta protracta* Miq. in Linnaea 18:71. 1844.



Rather weak, diffusely branching herbs 4–8 dm. tall, essentially glabrous throughout; leaves both basal and cauline, ovate to ovate-lanceolate, rather gradually acute to acuminate, base broadly obtuse, 10–20 cm. long, 3–8 cm. broad; petiole 1.0–1.5 cm. long, wholly callous; sheaths very narrow, 5–10 cm. long; inflorescence diffusely branching, the rachis rather distantly flexuous, several to many-flowered; bracts caducous, oblong, obviously leafless sheaths, 2–4 cm.



Fig. 61. *Maranta arundinacea*

long; pedicels 0.5–1.5 cm. long; sepals ovate-lanceolate, 1.0–1.5 cm. long, persistent and accrescent in fruit; perianth (including the staminodia) about 2 cm. long, white; fruits nut-like, ellipsoid, about 1 cm. long.

Very widely distributed throughout all tropical America, possibly indigenous to Central and northern South America. Frequently encountered in thickets and waste places.

CANAL ZONE: Ancón Hill, Woodson, Allen & Seibert 1317; Balboa, Standley 26486; Miraflores, Pittier 3964. CHIRIQUÍ: upper Río Chiriquí Viejo, Seibert 405. PANAMÁ: Isla Taboga, Woodson, Allen & Seibert 1438; between Panamá and Chepo, Dodge, Hunter, Steyermark & Allen 16665; Matias Hernández, Standley 28965.

Arrowroot starch, used by laundresses, is obtained from the tuberous rootstock of this plant, known in some localities as *Sagú*.

#### 5. STROMANTHE Sond.

STROMANTHE Sond. in Hamb. Gartenzeit. 5:225. 1849.

*Marantopsis* Koernicke in Bull. Soc. Nat. Moscow 35<sup>1</sup>:97. 1862.

*Kerchovea* Jorissenne in Belg. Hort. 32:201. 1882.



Fig. 62. *Stromanthe lutea*

Rhizomatous caulescent perennial herbs; leaves chiefly basal, 2-ranked; inflorescence racemiform or paniculate, several- to many-flowered, the rachis closely and sharply zig-zag; bracts caducous, usually orange or yellowish, subtending small groups of inconspicuous sessile or subsessile flowers; sepals 3, free and equal; corolla with a very short tube, the lobes 3, nearly equal; fertile stamen 1, somewhat petaloid; staminodia 4, rarely 2, the outer 2 petaloid, occasionally suppressed; ovary inferior, 1-celled; fruit a 1-seeded, loculicidally dehiscent capsule.

1. *STROMANTHE LUTEA* (Jacq.) Eichl. in Abh. Akad. Berlin 1883:81. 1883;  
Woodson & Schery in Ann. Missouri Bot. Gard. 29:334. 1942.

*Maranta lutea* Jacq. Collect. 4:117. 1790; Icon. Pl. Rar. 2: pl. [201]. 1786-1793.

*Maranta Jacquinii* R. & S. Syst. 1:558. 1818.

*Marantopsis lutea* (Jacq.) Koern. in Bull. Soc. Nat. Moscow 35<sup>1</sup>:97. 1862.

*Myrosma Guapilesense* Donn. Sm. in Bot. Gaz. 23:251. 1897.

Fairly stout herbs 1-2 m. tall; leaves chiefly whorled at the base of the stem, long-petiolate, oblong-elliptic, very abruptly and shortly acuminate, base broadly obtuse to rounded, 20-40 cm. long, 8-12 cm. broad, glabrous or the midrib inconspicuously puberulent above; petiole 3-5 cm. long, almost wholly callous; sheath 20-30 cm. long, scatteringly pilose to glabrate; spikes rather diffusely and paniculately compounded, the rachis closely and sharply zig-zag, the internodes about 0.3 cm. long; bracts broadly elliptic-oblong, obtuse, 1.0-2.5 cm. long, orange or deep yellow, essentially glabrous, caducous immediately after anthesis; flowers about 1 cm. or somewhat less, orange or yellow, the outer staminodia lacking.

Costa Rica to Venezuela; chiefly in lowland thickets and open forest.

CANAL ZONE: Barro Colorado Island, Woodson & Schery 967; Chagres, Fendler 442; Quebrada López, Allen 2125.

## 6. THALIA L.

*THALIA* L. Sp. Pl. 1193. 1753.

*Peronia* de la Roche in Redouté, Liliac. 6: pl. 342. 1812.

*Molacarya* Raf. in Amer. Month. Mag. 190. 1819.

*Spirostalis* Raf. Fl. Tellur. 4:51. 1836.

Rhizomatous caulescent perennial herbs; leaves 2-ranked, both basal and cauline; inflorescence laxly paniculate, the rachis closely and sharply zig-zag; bracts more or less foliaceous, caducous immediately after anthesis; sepals 3, free and equal; corolla with a very short tube, the lobes 3, equal, hyaline; fertile stamen 1, somewhat petaloid; staminodia 3, the outer solitary, conspicuously petalaceous; ovary inferior, 1-celled; fruit nut-like and indehiscent, 1-seeded.

1. *THALIA GENICULATA* L. Sp. Pl. 1193. 1753.

*Maranta geniculata* (L.) Lam. Tabl. Encycl. Meth. Bot. 1:9. pl. 1, fig. 2. 1791.

*Thalia erecta* Vell. Fl. Flum. 1: pl. 17. 1827.

*Maranta flexuosa* Presl, Reliq. Haenk. 1:107. 1827.

Fig. 63. *Thalia geniculata*

Juan Díaz, *Standley* 32047; Matías Hernández, *Standley* 31925; Río Tecúmen, *Standley* 26543.

*Thalia angustifolia* Wright, ex Griseb.  
Cat. Pl. Cub. 256. 1866, non  
Peters.

*Thalia altissima* Klotzsch in Schomb.  
Reise in Brit.-Guiana 3:917. 1848.

Plants rather stout, 2–4 m. tall; leaves ovate to ovate-lanceolate, 20–75 cm. long, 5–30 cm. broad, gradually and narrowly to very abruptly and shortly acuminate, base obtuse to rounded, glabrous; petiole 30–50 cm. long, the callus very short; sheath 30–100 cm. long; inflorescence diffusely paniculate, many-flowered, the rachis slender and sharply zig-zag, with internodes 0.5–1.0 cm. long; bracts oblong-lanceolate, 1.0–2.5 cm. long, foliaceous, caducous immediately after anthesis; flowers about 1.5 cm. long, the outer staminodium purple.

Florida; Mexico to Argentina; Antilles, in lowland marshes.

CANAL ZONE: Chagres, *Fendler* 338; Barro Colorado Island, *Sbattuck* 683. CHIRIQUI: San Felix, *Pittier* 5441. DARIÉN: El Real, *Allen* 958. HERRERA: Santa Maria, *Allen* 789. PANAMÁ: between Panamá and Chepo, *Dodge*, *Hunter*, *Steyermarck* & *Allen* 16708;

The first of these was the discovery of gold in California in 1848. This discovery led to a great influx of people to California, and the state became a great center of population. The second was the discovery of gold in Nevada in 1859. This discovery led to a great influx of people to Nevada, and the state became a great center of population. The third was the discovery of gold in Colorado in 1858. This discovery led to a great influx of people to Colorado, and the state became a great center of population. The fourth was the discovery of gold in Idaho in 1860. This discovery led to a great influx of people to Idaho, and the state became a great center of population. The fifth was the discovery of gold in Montana in 1862. This discovery led to a great influx of people to Montana, and the state became a great center of population. The sixth was the discovery of gold in Wyoming in 1863. This discovery led to a great influx of people to Wyoming, and the state became a great center of population. The seventh was the discovery of gold in Utah in 1864. This discovery led to a great influx of people to Utah, and the state became a great center of population. The eighth was the discovery of gold in Arizona in 1865. This discovery led to a great influx of people to Arizona, and the state became a great center of population. The ninth was the discovery of gold in New Mexico in 1866. This discovery led to a great influx of people to New Mexico, and the state became a great center of population. The tenth was the discovery of gold in Texas in 1867. This discovery led to a great influx of people to Texas, and the state became a great center of population.



The discovery of gold in California in 1848 led to a great influx of people to California, and the state became a great center of population. The discovery of gold in Nevada in 1859 led to a great influx of people to Nevada, and the state became a great center of population. The discovery of gold in Colorado in 1858 led to a great influx of people to Colorado, and the state became a great center of population. The discovery of gold in Idaho in 1860 led to a great influx of people to Idaho, and the state became a great center of population. The discovery of gold in Montana in 1862 led to a great influx of people to Montana, and the state became a great center of population. The discovery of gold in Wyoming in 1863 led to a great influx of people to Wyoming, and the state became a great center of population. The discovery of gold in Utah in 1864 led to a great influx of people to Utah, and the state became a great center of population. The discovery of gold in Arizona in 1865 led to a great influx of people to Arizona, and the state became a great center of population. The discovery of gold in New Mexico in 1866 led to a great influx of people to New Mexico, and the state became a great center of population. The discovery of gold in Texas in 1867 led to a great influx of people to Texas, and the state became a great center of population.

THE HISTORY OF THE UNITED STATES



## FOREWORD

On February 2 and 3, 1945, a conference on "Gene Action in Micro-organisms" was held in St. Louis under the auspices of the Missouri Botanical Garden. The papers read at that conference and a portion of the discussion are presented here in a more permanent form.

The early decades of Genetics were largely taken up with studies of higher plants and animals. Recently it has become increasingly apparent that such micro-organisms as protozoa, fungi, and bacteria are readily investigated by genetic techniques. As a matter of fact, once the preliminary difficulties are removed they may even possess certain definite advantages for physiological and biochemical problems. They are so small and easy to manipulate that they may be studied directly in the laboratory in various special ways which would be impossible with larger organisms, as, for instance, in a Warburg manometer. Because of these peculiar advantages, investigators in several fields have turned to the genetics of micro-organisms in the last few years. Mycologists, parasitologists, biochemists, and immunologists have found themselves studying the same fundamental problems but with a wide variety of micro-organisms. The conference called by the Missouri Botanical Garden had as its main purpose the integration of the research work now going forward in several such laboratories.

